

# RAILROAD GAZETTE

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## EDITORIAL ANNOUNCEMENTS.

**THE BRITISH AND EASTERN CONTINENTS** edition of the Railroad Gazette is published each Friday at Queen Anne's Chambers, Westminster, London. It consists of most of the reading pages of the Railroad Gazette, together with additional British and foreign matter, and is issued under the name Railway Gazette.

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FRIDAY, NOVEMBER 24, 1905.

The *Railroad Gazette*, a magazine that has considerable to say against government control of railroad rates, suggests that the government ought to quit talking about rates and take measures to reduce the loss of life in railroad accidents. To use the stock railroad argument on the rate question, this is certainly socialistic, and an invasion of the rights of private property. Reasoning a la Parry we may say that from government interference with railroad accidents it is but a step to legislation to keep farmers from driving kicky mules and small boys from going in swimming. To legislate for the prevention of railroad destruction of human life is certainly not less socialistic not to say anarchistic in principle than to legislate against railroad destruction of commercial life via the rebate, the discrimination, or the exorbitant rate.—Lincoln, Neb., *State Journal*.

Very well, neighbor, but how is it in Lincoln? Do they legislate against revolver practice in the streets, or is that looked upon as being equally socialistic with statutory regulation fixing the price of groceries? Does any body of men in Lincoln concern itself with the enforcement of statutes designed to prevent fires and the spread of contagious disease, or would such a body lay itself open to the charge of anarchy? We ask these questions, not in a cynical spirit, but because we want you to believe that the protection of human life is an office of Government. So far as rate regulation is concerned, permit us to point out that we are heartily in favor of legislation which will prevent rebates and discrimination; the legislation we are opposed to is the kind that could not possibly prevent either one of these evils. As a shining example of a bill warranted to hit everything in sight, except the target, we commend to your attention the document introduced last spring by Messrs. Esch and Townsend.

A little more than a year has gone by since the President of the New York, New Haven & Hartford Railroad Company forecast as a sure thing in the future of his corporation not so very far remote, "interchangeable" electric traffic between his now great trolley system and electrified steam lines. Stated in its briefest terms his prophecy forecast a centralizing of urban trolley traffic at stations, entrainment, and redistribution at other stations; so that a passenger taking the car at his door in one city could be delivered over the electrified steam line at the "doorway of destination" in another city. The first step in this project is now shown by the announcement that only a dispute with the Hartford authorities as to the kind of rail to be used stands in the way of interchangeable traffic in that city. The plan is to exchange traffic at East Hartford from an electrified steam line reaching to the city of Rockville, Conn., and the distributed traffic covering Hartford where the New Haven Company owns the extensive connecting

trolley system. As a pioneer venture toward the greater union of the present steam and trolley lines such an event would be of import anywhere. In the case of the New Haven Company it bulks larger, not merely because of Mr. Mellen's utterance, but because of the size and location of the street railway systems which he has annexed. It has grown in a year and a half from 43 single track miles to about 588 miles. It reaches to Worcester, Springfield and Pittsfield in Massachusetts, and to New Haven, Hartford, Norwich, New London, Meriden, Middletown, Willimantic, Putnam and Stamford in Connecticut—in all 12 cities with a present population of about 550,000, and in all but one or two of which the New Haven has absolute control of the local trolley systems. Here are conditions remarkably favorable for the "bunching" and "distribution" experiment. And even if they were somewhat less favorable locally we could probably trust the boldness of Mr. Mellen to make the test on his great electric systems, which is showing an almost phenomenal increase of earnings this year as compared with last, when it "washed" the investment and went some \$75,000 beyond. A singular twist it is, in railroad annals, which has thus brought what was a few years ago the most old foggy railroad company in the country to the front of the electrical advance. With such a progressive record it seems incredible that the corporation will flout public safety and oppose electric standardization at its New York terminal.

Standardization of the location of the conductor rail for direct current electrification is of such considerable economical importance that it would indeed be regrettable if variations were made to an extent which would prevent free interchange of equipment. This we believe to be true not only as to neighboring roads but also for the whole country, for we cannot now foresee the ultimate growth of interchange of electrically operated cars and trains. Our esteemed contemporary, the *Railway Age*, has properly called attention to this matter in describing the Long Island standard and the New York Central standard, but it is misled in concluding that, "it is evident that the effort to standardize the location of these rails has been abandoned." The error is a natural one and is due to the confusing methods of measurement used by different engineers in describing the position of the conductor rail. One will give the horizontal distance from the gage line of the track rail to the center of the conductor rail; another, the center to center distance between the two rails, and there are apparently all the possible variants from these two methods. Indeed, one

authority insists on giving the horizontal distance from the center of track to the center of the conductor rail. We do not criticize our contemporary for being misled under such circumstances, and call attention to the matter only for the purpose of preventing a wrong impression. It is a fact that so far as the location of the conductor rail is concerned on the Long Island and on the New York Central there is nothing to cause embarrassment in interchange of equipment. The center of the New York Central's conductor rail is 28¾ in. from the gage line of the track rail. On the Long Island the inside of the head of the conductor rail is 26 in. from the gage line of the track rail; therefore, so far as this horizontal distance is concerned the clearances are near enough alike. The reason for the peculiar statement of measurement made by the Long Island is that they were forced to use, as conductors, rails of different sizes, and therefore the gage line measurement seemed to be necessary. The Long Island road uses a top contact conductor rail. The New York Central uses an under contact rail (described in the *Railroad Gazette* for September 1, page 199); a most ingenious and promising method of preventing loss of life, and, we are assured, easily adaptable to interchange with the cars of the Long Island road.

As might have been expected, President Mellen, of the New York, New Haven & Hartford Railroad, since his attention has been called to the details of the subject, does not propose to allow his company to remain or to be placed in a wrong position with reference to the electric operation of his trains at the Grand Central terminal in New York. We have never believed it to be possible that this able, experienced railroad officer could be for a moment in doubt in any question involving his duty to the public in furnishing the safest and most convenient transportation under the new conditions which are to prevail at the New York terminal. The only danger, as we see it, is now the limitations of time. We have asked Mr. Mellen a specific question, as follows: "Do you intend to use in the New York Central suburban terminal fireproof cars in motor car trains, with a multiple unit system of motor control?" Mr. Mellen replies, "The New Haven road will do whatever is necessary for the accommodation of the public patronizing its lines, and its equipment will conform to the New York Central standard, with such improvements as have been made in electrical traction subsequent to the placing of the New York Central's orders." This reply is an assurance which should satisfy every one, and should place beyond doubt the duty so imposed upon the New Haven's engineers. Mr. Mellen was also asked to give his opinion on the kind of electric locomotives ordered for the New Haven electric service and the feasibility of using these locomotives when taking their power from the direct current line between Woodlawn and Grand Central Station. In reply, he points to the following quotation from a letter written by the Chief Engineer of the Westinghouse Electric & Manufacturing Company:

"It is interesting to note that these locomotives have been pretty generally referred to as 'Single-Phase' or 'Alternating.' We, among ourselves, have used these terms and are perhaps responsible for the nomenclature. In reality, however, the equipment of these locomotives is simply a high-class direct-current arrangement adapted for operation on alternating current as well. The motors are not primarily designed for alternating current and adapted for operation on direct-current, but knowing the problem which we had to meet, they were in reality designed for the very highest class of direct-current service, and they will operate successfully on alternating current. In accomplishing this result, the fundamental features which make for a good direct-current railway motor have not been slighted, but on the contrary they have been amplified in order that the motors may work successfully on alternating current. We may take it as a fundamental condition in this class of work that in order that a motor work successfully on alternating current, it must be an extremely good direct-current motor."

"In other words," said Mr. Mellen, "we desire to secure an option between the direct and alternating currents."

#### A PROMISING STEEL TIE.

Three serious objections have in general been raised to all the forms of steel ties so far proposed: First, they are conductors of electricity and require insulation for electric track circuits. Second, they are so rigid that rails break under heavy traffic. Third, they cost too much. The York process for rolling steel ties from old rails, which is described elsewhere in this issue, seems to have met two of these objections. It is cheap and elastic. The method of insulation is a problem for the signal engineers to work out as they have done in the case of rail joints and switch connections. They have a free hand in this case.

Under the heavy axle loads of modern locomotives the track

must deflect to some extent and if the ties are rigid then the rails must bend or break. This has been the experience in this country. On one road where Carnegie steel ties were tried, 60 rails broke. In Europe, where steel ties have been in use for many years, this trouble has not been met; probably because the axle loads are comparatively light and permit a form of elastic tie which has been generally adopted. This bending and crushing under the rails was the cause of the removal after a short time of some experimental ties of this "Post" type which were laid about 20 years ago in this country and failed completely under the heavy traffic. Nearly all of the recently proposed forms for steel ties have gone to the opposite extreme in stiffness and rigidity, most of them being I-beam sections with wide flanges having a large section moment. Where such ties have been laid in the track the result has been rail failures instead of tie failures.

Theoretically a perfectly bedded tie is a constrained beam uniformly loaded by the upward pressure of the ballast on the bottom side and having two points of support under the rails. Imperfect tamping may greatly increase the bending moment at the center, and it is essential that a tie should have some spare strength to endure imperfect track work. The rail also acts as a constrained beam supported at intervals and carrying concentrated loads under each wheel. The complicated internal stresses and external reactions set up produce the wave motion which if resisted by the rigidity of the supports increases the internal stresses enormously, and under the combined effects of heavy loads, hammer blow and impact results too frequently in broken rails, especially where the rails are made as now by the United States Steel Company, with an eye single for tonnage and little regard for quality. Some elasticity is necessary but not by the sacrifice of vertical strength in the tie which in effect is the same as center binding with all of its bad results on the track.

The form of tie shown in another column has a concave bottom flange and seems to be designed on the right principle. The curved bottom flange acts as a broad semi-elliptical spring which can be given any desired arch and be made to flatten out under any given maximum axle load. The action of such a flange under successive wheel loads would not resemble the pumping action of a wooden tie which rises and falls in the ballast, for the shape of the flange tends to force out the ballast under each deflection until a perfect flat bed is formed on which the tie rests under load. The flange is rolled from the rail head and the enormous reduction of metal together with the low temperature at which the finishing passes are made increases the elastic limit and ultimate strength of the metal to a point equal to if not exceeding many brands of spring steel. Some elasticity could be given in the top flange as well if it seemed desirable, as the curve can be rolled equally well on either or both top and bottom. Whether or not this would entirely overcome the difficulty of breaking rails remains to be seen by actual trial. It looks promising.

The last objection of excessive cost can be met with calculations of cost per year in track based on actual figures of first cost and life of steel and wooden ties, which would show that the cost per year per lineal foot of track according to the formula of Mr. S. Whinery (*Railroad Gazette*, Nov. 11, 1904, p. 537), would be 5.9 cents for wood ties costing 60 cents apiece and 5.8 cents for steel ties made by this process. No meritorious steel tie which we have yet seen can be laid in the track for less than \$3 each, and some that have been proposed cost as high as \$4.50 each. These costs are prohibitive, even considering the life of the steel tie to be as much as 35 years or more. The commercial proposition to the railroads with the York process is to exchange one ton of steel ties and fastenings for two tons of rail scrap of anything over 56-lb. section and in any length or condition of wear. Rail scrap is a drug on the market in many localities since the general introduction of the continuous process of making open hearth steel from hot metal from the blast furnace with the consequent falling off in the demand for heavy melting stock. Present quotations are \$15 a ton delivered in Pittsburg, and in most markets some distance from the steel district the price is as low as \$10 or \$12 a ton. A ton of steel ties weighing 160 lbs. each would cost therefore about \$28, or \$2 apiece, with fastenings. If we assume a life of 25 years for steel ties and eight years for wooden ties, 15 cents as cost of removing and replacing each and allow a scrap value of 90 cents for the wornout steel tie at the end of its life, we can calculate the annual cost of the steel tie and the cost of new wooden ties to give an equivalent annual cost. The annual cost of the steel tie per lineal foot of track on this basis is 5.8 cents, and the cost of new wooden ties on an equivalent basis would be

58 cents. These figures are conservative and if they err it is in favor of the wooden tie for any reduction in the value of scrap or increase in the length of life of the steel tie would lower the maximum economical cost of wooden ties which on the assumptions made is less now than the cost of hardwood ties in many parts of the country.

If a railroad using 500,000 ties a year or more were to figure on building and operating a mill for its own use the cost would be still farther reduced. One of the most economical features of the process in this respect is the fact that such a plant could be installed wherever a supply of fuel and old rails could be had regardless of the supply of raw material, ore, pig iron, blooms or billets. The farther from the steel district the more economical the product, owing to the saving in transportation.

The estimated annual production of steel rails for 1906 is 3,000,000 tons, of which probably two-thirds will be used for replacements. If one-half of the rails taken up were available for re-rolling to ties an annual production of 12 to 14 million ties would be possible. The supply of old rails would always exceed the demand for new ties.

### THE PANAMA CONTRETEMPS.

It is not an easy nor a gracious task to pronounce judgment upon the conclusions of the Advisory Board of Engineers regarding the best type for the Panama Canal in advance of the appearance of its forthcoming report, or reports, for it is supposed that there may be several. Neither is it permissible here to segregate the members of the board, as the daily papers seem to be doing, and assign reasons for the actions of the respective groups. The situation is indeed serious and disappointing to those who have been hopeful of a speedy solution and final settlement of this long reaching problem, but it is one on which more light is needed before an intelligent measure can be had of the relative values of the conflicting opinions which evidently exist in the minds of the members of the board. That light can only be shed by a clear statement of the existing physical facts upon which the differing views are predicated and for that the public must perforce await the reports.

It is amazing that this condition of uncertainty should obtain after all that has been done and said and thought regarding the question of a canal at Panama, continuously for the last thirty years or more, to go no further back; but the fact that it does exist is significant of the diversified and intricate nature of the problem. Looking backward we find at every turn the same conflict of opinion regarding the question of level, but apparently as the different stages of the matter have been reached the difficulties have but multiplied. We find that in 1879 a majority of the engineers constituting the International Congress of Paris, who came from various countries, including the United States, decided upon the Panama route for the express reason that in their judgment a canal at the sea level was essential and could not elsewhere be built. In the absence of definite data, it was then assumed that the canal could be cut "à niveau" across the Panama Isthmus at a not excessive cost; it was well known that nowhere was there another location where the idea could be even entertained. Subsequent developments have shown that the sea-level plan, such as it was, had not the support in the congress of those best qualified by experience to determine the question, but there was no other treatment proposed for Panama at that time, it being vaguely generally understood that a high-level canal, with locks, besides being thought undesirable for other reasons, was impracticable because of the supposed impossibility of controlling the Chagres river floods at the higher level and the absence of suitable sites for the dams and locks, and other structures that would be required.

Thus the sea-level idea prevailed, and on that basis the work was taken up and carried on by the first French company, now known as the Old Panama Canal Company, to distinguish it from its successor, until 1887, when the plan was so far modified as to provide for what were termed "temporary locks," to surmount the Culebra divide by means of a high level. It is interesting to recall that these locks were seriously proposed to be built of iron and so designed as to be removable later without disturbing the navigation when the canal should be ultimately brought down to the sea level, an idea that at this moment is being brought forward as a new and feasible solution, by one of the engineers who has contributed to the more recent discussion of the subject. When the old Panama Canal Company went to smash in 1889, after upward of \$400,000,000 had been squandered in the undertaking, no progress

had been made on the lock project, but in 1894 the new Panama Canal Company took over the work and prepared plans for a permanent lock canal, with a summit level of about 100 feet above the sea level, afterwards modified as an alternative by lengthening and lowering the summit level to 66 ft. But up to the time of the United States intervention the question as to which of the two summit levels should be chosen had not been determined nor had any work been actually entered upon other than excavation applicable to either. In 1901 the United States Isthmian Canal Commission, after rather more than two years' investigation, reported that the most feasible and practicable route for a ship canal across the American isthmus was the Nicaragua route, but in 1902 the same Commission reported in favor of the Panama route, the new Panama Company having in the meanwhile reduced its selling price from \$100,000,000 to \$40,000,000, at which price the purchase was subsequently made. In its report the Isthmian Canal Commission rejected the sea-level idea and provided for a lock-canal with a maximum summit level of 90 ft. above mean ocean level.

This called for a high dam at Bohio as its dominant feature, together with six locks, and other important structures. Following upon the recommendation of the Isthmian Canal Commission, the Congress of the United States in 1902, as every one knows, passed an Act providing for the purchase of the new Panama Canal Company's rights, and on February 29, 1904, the President appointed the Panama Canal Commission to take charge of the work. This Commission did not adopt the plan above outlined (or any other, in point of fact), but proceeded to make further examinations of the physical conditions, and as a result its Engineering Committee reported early in the present year a recommendation for "A sea-level canal with a bottom width of 150 ft., a minimum depth of water of 35 ft., and with twin-tidal-locks at the Pacific end, at a total estimated cost of \$230,500,000." Shortly after this report was formulated the Panama Canal Commission was reorganized, and the question of what type of canal should be adopted was submitted by President Roosevelt to the Advisory Board of Engineers, whom he had appointed for the purpose. This brings us to the present moment, and to the completion of the cycle of engineering opinion, the recommendation of the majority of this second International Congress of Engineers, as it in substance is coinciding, in 1905, with that made by the first one in 1879 that there should be a sea-level canal at Panama.

Another curious fact about it is that both the first plan proposed and the last depend alike for their successful execution upon the proper placing of a high masonry dam at Gamboa to impound and regulate the flood discharges of the upper Chagres. This project was abandoned by de Lesseps, it is said, because no suitable foundation for the dam could be found, whereas the Engineering Committee of the Panama Canal Commission has stated that "The practicability of certainly and satisfactorily controlling the floods of the Chagres by so simple and economical method as the (proposed artificial) Gamboa Lake and its outflow channels \* \* \* makes the construction of a sea-level canal \* \* \* far more available than has heretofore appeared possible."

Turning to the plan for the lock canal, we find that it, too, depends for its practicability upon a high dam at Bohio. Much discussion of a technical nature has already been entered into by engineers concerning the possibility of securing a safe foundation at the proposed site. It has been demonstrated by numerous borings that the rock formation, if indeed any there exists, lies too deep below the water level to be available with any approved known engineering method, and the practicability of the lock plan now turns upon whether an enduring structure of the kind required can safely be built upon and in the previous strata which underlie the site. This is indeed a vital question, and one that imperatively demands further elucidation than has yet appeared in any published report. Similar doubts have been entertained and expressed regarding the foundations of the locks which it has been hoped might be dispelled through the studies of the Advisory Board, but that hope, in the face of the divergent opinions, must be deferred.

It is a most serious dilemma which now confronts the Government; on the one hand is the inevitable conclusion, from which there can be no escape, that unless suitable foundation for all the important structures can be proved to exist, in advance of the actual design and execution, such as will insure the permanency of the established water levels as well as the enduring structural safety and efficiency of the canal, the lock plan must be abandoned as being visionary and precarious; on the other hand, lies the probability, almost, indeed, amounting to a certainty, that the sea-level plan will

require an unknown increase in cost and indefinite delay in time of completion. No halfway measures will suffice, and no chances can be taken in dealing with a work of this kind with its consequences so far reaching and portentous, for the commerce which the canal is to serve and which will spring into existence because of it, will be for the most part absolutely dependent upon it, and if after creating the commerce the canal should fail or become inoperative, dire commercial disaster and widespread trade ruin would result. These are truisms which seem to find no lodgment in the minds of the canal enthusiasts.

But there should be no hesitancy about the course to be pursued. Instead of boasting about "making the dirt fly" and leading on the country with baseless hopes of a speedy completion, the whole energy of the authorities should be directed to the determination of the one question of the practicability of building an enduring lock-canal. If the data already at hand are not sufficient to establish the required facts beyond the peradventure of a doubt, they should be supplemented, at whatever cost, before proceeding further. If the results reached prove this point, they will also suffice to accurately estimate the quantities and cost of construction. Not until these latter points can be cleared up will it be worth while to even attempt to decide which of the two types is theoretically the better or which in the end the more costly. All this will, of course, mean more or less delay for the present, but will undoubtedly save time in the end, as well as money, and reduce to a reasonable certainty what is now but a mystery of the dreamers. To take what appears to be a step backward, though really it is not, requires courage, but when prudence and wisdom and common sense and economy all demand it, the Government should call a halt.

#### Railroad Gross Earnings in September.

The gross earnings of most roads during September show even more favorable increases than they did in August. The general prosperity of the country was on the increase and the movement of crops was beginning to have an effect in increased traffic in general merchandise which comes as soon as profits are taken on crops. Some of the central roads, notably the Wabash, and the Cleveland, Cincinnati, Chicago & St. Louis, show decreases compared with their August earnings, due to the fact that their figures compared with those of a period last year when the passenger traffic was unprecedented owing to the World's Fair at St. Louis. Six roads of the trunk lines show gross earnings of \$30,711,044, an increase of \$2,921,600, 11 per cent., over the figures for September, 1904. This is a greater rate of increase than was shown last month and is perhaps accounted for by the increase in the amount of building materials, especially structural steel, carried. The eastbound trunk line movement of grain from Chicago and points near Chicago during this month amounted to 5,743,000 bushels, which is over 2,000,000 bushels heavier than the same movement in 1904. Of the Southern group, the gross earnings of nine roads were \$17,612,631, an increase of only \$89,430, 1 per cent. The yellow fever at New Orleans had still worse effect on traffic in September than in August. Certain individual roads in this group, however, show substantial increases, due to the great activity in the manufacturing towns of the South and also to the fact that the net overland movement of cotton amounted to 18,729 bales, over 4,000 more than in 1904. The coal roads continue the good showing of the previous month. Ten roads report gross earnings of \$18,913,481, an increase of \$2,394,706, 15 per cent. The anthracite situation was strong and the movement heavy. Shipments of anthracite during this month amounted to 5,082,232 tons, as compared with 3,967,600 tons shipped during the same month last year. The iron and steel activity also helped many roads in the coal region. The production of anthracite and coke pig iron in September was 1,898,873 tons, an increase of 546,196 tons. Seven of the granger roads show gross earnings of \$20,066,140, an increase of \$1,897,191, 10 per cent. An indication of the large business done by these roads is the number of cars handled by the Lake Superior Car Service Association, the figures being 38,079 cars, as compared with 34,716 cars handled during September, 1904. At the five great interior markets the live stock receipts during this period were 3,266,729 head, comparing with 2,997,235 head last year. At twelve interior markets during this month, the total grain receipts were 86,035,987 bushels, an increase of over 1,000,000 bushels. These lines also participated in the heavy traffic of manufactured articles to points west of Chicago, which was about 15 per cent. greater than in 1904. The southwestern roads did not make quite such a good showing as in August. The floods in this region seriously hampered some of them. Five roads in this group show gross earnings of \$14,269,705, an increase of \$741,449, 6 per cent. The trans-continental roads show the largest per cent. of increase. Five of them report gross earnings of \$30,757,235, an increase of \$4,376,977, 17 per cent. These roads, with their through traffic, naturally get the benefit of the

good results in all the other groups of roads. The accompanying table shows the gross earnings for September, 1905, and the increase over the figures for September, 1904, of 46 roads:

	September, 1905.	Increase over Sept., 1904.
Atchison, Topeka & Santa Fe.	\$6,457,832	\$301,491
Atlantic Coast Line	1,892,798	163,133
Baltimore & Ohio	6,547,806	499,046
Buffalo, Roch. & Pitts.	805,816	67,182
Canadian Pacific	4,872,375	651,699
Central of Georgia	1,018,740	93,572
Central of New Jersey	2,159,760	325,010
Chesapeake & Ohio	2,000,285	281,394
Chicago & Alton	1,045,339	*222,820
Chicago & North-Western	5,766,336	379,712
Chicago Great Western	845,884	133,326
Chicago, Milwaukee & St. Paul	5,261,887	571,750
Chicago, Rock Island & Pacific	4,719,385	601,504
Chicago, St. Paul, Minn. & O.	1,278,848	57,853
Cin., New Orleans & Tex. Pac.	694,090	54,552
Cleve., Cin., Chic. & St. Louis	2,072,137	*78,360
Colorado & Southern	681,322	142,627
Denver & Rio Grande	1,742,260	217,261
Erle	4,431,612	407,590
Great Northern	4,955,650	1,057,856
Hocking Valley	589,445	40,332
Illinois Central	3,960,057	*380,650
Interoceanic of Mexico	464,299	*8,718
Lehigh Valley	2,973,475	471,605
Louisville & Nashville	3,547,193	215,753
Mexican Central	2,178,652	257,230
Mexican International	494,134	18,353
Minn., St. P. & S. S. Marie.	1,148,461	375,866
Missouri, Kansas & Texas	1,845,950	73,172
Nash., Chatt. & St. Louis	869,135	11,546
National R. R. of Mexico	1,094,909	198,186
New York Cent. & Ind. River	8,106,297	855,756
New York, Ontario & Western	655,980	61,531
N. Y., Susq. & Western	246,486	38,181
Norfolk & Western	2,398,545	390,586
Northern Pacific	5,837,842	1,141,063
Penn. Lines, East of Pittsburg	11,602,439	1,988,300
Philadelphia & Reading	3,509,358	691,484
Pitts., Cin., Chic. & St. Louis	2,335,747	195,103
St. Louis & San Francisco	3,542,341	6,898
St. Louis Southwestern	712,519	*53,347
Southern	4,456,360	166,719
Southern Pacific	8,881,660	744,709
Union Pacific	6,209,508	781,650
Wabash	2,162,812	*446,849
Yazoo & Mississippi Valley	461,739	*181,848
Total	\$136,562,230	\$12,886,404

\*Decrease.

#### October Accidents.

The condensed record of the principal train accidents which occurred in the United States in the month of October, printed in another column, contains accounts of 24 collisions, 24 derailments, and five boiler explosions. Those accidents which were most serious, or which are of special interest by reason of their causes or attending circumstances, occurred as follows:

Date.	Place.	Killed.	Injured.
1st	St. Paul, Minn.	1	5
14th	Springfield, Ill.	1	3
15th	Seaton, Ill.	5	0
16th	Fresno, Cal.	3	0
20th	Callente, N. Mex.	2	3
21st	Fort Scott, Kan.	0	30
22d	Eckley, Colo.	1	0
26th	Fairfield, In.	4	15
30th	Sheffield, Mo.	13	46

The cause of the disaster at Sheffield, Mo., killing 13 persons, was given in the press despatches as a loose rail, but later accounts report the officers of the road as declaring that the fault was neither in the rails nor in the wheels; that more likely it was a defect in the tender, either in the curve plates or in the unequal distribution of its load. But whatever the primary cause of the derailment, there appears to be no question that all of the fatal injuries happened to passengers riding in the smoking car, and that this car was crushed between a heavy baggage car in front of it and a heavy chair car behind it—which lends support to the assertion that the smoker was an old and comparatively weak car, while the other two cars were heavy and strong.

The next largest death list was that of the derailment at Seaton, Ill. This was not a passenger train, but five men were killed. Two of the five lived several hours, one of them being terribly scalded; and all this from what cause? Apparently from the lack of suitable fences or of efficient track-watching—or possibly from excessive speed. In many train accidents there is much discussion as to what is the most suitable preventive, but there can be no need of explanatory discussion here. Either providing good fences or driving cattle away would be a most prosaic proceeding, but all the King's inspectors could suggest nothing better. The payment of premiums to enginemen for care in not running over animals is well enough so far as it goes, but at best it can be only a palliative. As long as cattle have access to the track the only safety is in very low speed. Passenger trains sometimes escape disaster by their very high speed, but when a 1,200-lb. cow is lying down on the track, not every cow-catcher can be trusted to pick her up, however high the speed may be.

The Fairfield collision, killing four and injuring 15, once more illustrates the risks of the "American despatching system."

Two passengers were killed in a rear collision on the Canadian Pacific near Ignace, Ont., October 30.

The number of electric car accidents reported in the newspapers

in the United States in the month of October was 23, in which four persons were killed and 190 injured. One of these accidents was a rear collision in the subway at Boston Oct. 28, on a line well equipped with block signals and automatic train-stops. Many passengers were injured. It appears that the motorman of the leading train, having found difficulty in starting forward, started back a little distance; but the distance was not little enough, for he set back so far that he fouled the block section next in the rear.

#### Modification of Air-Brake Law, August, 1906.

The Interstate Commerce Commission, reporting on the facts gathered at its hearing of November 2, has issued an order, prepared by Commissioner Cockrell, requiring that the minimum percentage of air braked cars to be used in trains, under the Safety Appliance law, shall be increased from 50 per cent. to 75 per cent.; and the date when this order shall go into effect is fixed as the first of August, 1906. The number of freight cars in service October 1 was 1,790,113, of which 1,564,396 were equipped with air brakes. These totals are a little larger than those given in the incomplete table issued by the Commission, November 2, and reprinted in the *Railroad Gazette* of November 10, page 447. The report of the Commission says that from the best information obtainable the number of private freight cars in use in this country is 111,122. Practically all these are air braked, making the total number of air braked freight cars now in use 1,675,518.

In the United States Court at Chicago on Monday last Judge Bethea decided against the Interstate Commerce Commission in its suit to compel compliance with its order requiring the railroads bringing live stock to Chicago, from the Missouri river and from St. Paul, to desist from charging more for live stock than for dressed beef. The decision which the commission here sought to enforce was issued January 7, last, and was reported in the *Railroad Gazette* of January 27, General News section. In the argument of this case before the Court at Chicago, President Stickney, of the Chicago Great Western, one of the defendants, presented a detailed study of the cost of carrying live stock on his road, and the substance of this study is published in another column of this issue of the *Railroad Gazette*. The report of the decision now at hand gives none of the reasons set forth by the Court; and Mr. Stickney's notes and observations do not deal with the whole question; but they are entertaining in themselves. They aim at only one point—to convince the court first, that it would be fair to charge a higher rate per hundred pounds for carrying live stock than for carrying fresh or salted meats, and, second, that he has not done so; and being thus restricted his essay leaves the reader asking questions. With the enormous quantities of ice now carried—with cured as well as with fresh meats—the old principle that live stock carrying is a more costly service comes dangerously near being wiped out of existence—a fact which furnishes one more evidence that times change. Even in the matter of speed, Mr. Stickney's road, it seems, doesn't hustle any more with cattle than with lard. Still he omits one fact which must in the long run increase the cost of moving live stock trains—the necessity of giving them preference over other trains. This really is an injury to the "dead" traffic carried by those other trains, and the rates on the "dead" traffic ought to be correspondingly lowered, at the expense of the live stock traffic. On the other hand, one of Mr. Stickney's items in the cost of live stock traffic will be thought by some too large—the cost of carrying the drovers. If it really is an essential element of the business that a man go to Chicago with every two cars of cattle, it is perhaps fair to charge a reasonable fare for carrying him and carrying him back; but as the stock-pass is in part a sop thrown by the railroads to the shippers, to keep them good natured, rather than a legitimate element in the business, the passenger service might well be estimated more nearly at the actual cost, which is probably much less than \$6.50. Charging for return haul of all of the stock cars also seems a trifle "steep." Loads ought to be found for some of them. However, these comments, like Mr. Stickney's estimates, lay no claim to thoroughness. We merely call the reader's attention to some entertaining figures.

Work on the Manhattan Bridge over the East river, New York, has again been stopped, this time by an injunction issued by a Supreme Court judge at the instance of a taxpayer restraining the city from awarding the contract to the Pennsylvania Steel Co., the one bidder at the time the bids were opened some months ago. The plaintiff alleges that the specifications were so drawn as to exclude other prospective bidders because of their inability to meet the rigid requirements for the nickel steel or high carbon steel to be used in the superstructure or stiffening truss. The judge in his opinion says:

"What justification is offered for such an unsatisfactory and costly method of specification? The hope is held out that during the two years before the material is needed experiments and actual results may show the

superiority of nickel steel over high carbon steel. But who is to decide which is to be used? The city claims that its engineer has the right to decide which of the two shall be ultimately used. The case is open to doubt. It is clear that the city seeks to make a wasteful contract based on specifications which are not sufficiently definite to afford an opportunity for fair competitive bidding."

It is evident that the learned judge is overwhelmed by the unintelligibility, to the layman's mind, of the specifications in question and is somewhat lacking in a clear understanding of the present status of nickel steel for engineering structures. The specifications on which bids were asked are a model document, clear, precise and far from being excessive in their requirements, either for nickel steel or the alternative high-carbon steel. Bidders had the right to submit bids for either material. The court holds that the plaintiff in his argument for an injunction showed that nickel steel would cost \$779,000 and high-carbon steel \$559,800. The successful bidder preferred to furnish nickel steel for the very good reason that it will soon have a plant in operation for turning out that material in large quantities for the Blackwell's Island Bridge. Had other contractors had such a plant or been prepared to furnish high-carbon steel of the required quality and quantity there would perhaps have been other bids submitted on one or both bases. As regards the uncertainty of nickel steel proving a satisfactory material for structural work where maximum strength with minimum weight is required little needs to be said. The Blackwell's Island bridge, now building, is ample justification for specifying this material in other structures of equal magnitude. This suit and injunction look suspiciously like a "nigger in the woodpile." There is evidently some motive back of it other than the personal objection of a dissatisfied taxpayer.

*Poor's Manual*,\* appearing again in its familiar form, leaves little new to be said about the excellent annual compilation of railroad statistics, having as its only defect the fact that so much time is required in the preparation of the matter that it is nearly a year old when presented. The tabular matter in the first part of the volume always affords interesting comparisons; figures showing the preponderance of bonds over stock in the year's new capitalization, which formed the basis of an editorial in our issue of Nov. 10, were quoted from the advance sheets of the *Manual*. The great gains in passenger traffic during recent years are also well shown in the tables, although when the entire system of the country is considered, freight has fully maintained its percentage of gain. We have previously taken occasion to point out that the rapid growth of the country should each year tend to increase the relative importance of passenger, as compared with freight traffic. Where population is very dense per mile of track, as in England, or in the territory served by the New Haven road, the two branches of traffic maintain almost a parity, instead of the wide divergence in importance that at present exists in this country as a whole. Yet in spite of the congested passenger traffic in certain parts of the country, it is worthy of note that freight earnings to-day actually constitute a larger percentage of gross earnings than they did 30 years ago. Thus, in 1875, earnings from passenger traffic constituted 27 per cent. of the gross earnings of the railroads in the United States, as reported in *Poor's Manual*. In 1880, this percentage had fallen just under 24, with an increase of 17 per cent. in the mileage of the country during the five years. From 1880 to 1885 the mileage increased 46 per cent., and in 1885 the ratio of passenger earnings to the total was 26 per cent. Since 1885 the returns may be tabulated as follows:

Per cent.		Per cent.	
Avg. annual increase in mileage.	Passenger earnings to gross earnings.	Avg. annual increase in mileage.	Passenger earnings to gross earnings.
1890.... 6.4	25	1902.... 2.0	23
1895.... 2.0	24	1903.... 3.5	22
1900.... 1.4	22	1904.... 2.0	23
1901.... 2.0	22		

#### NEW PUBLICATIONS.

*Multiple Telegraphs*. By A. C. Crehore, Ph.D., Mem. A. I. E. E. New York: McGraw Publishing Co. 6 in. x 9 in., pp. 124. Price, \$2.00.

The author of this book is an electrical expert of long experience and an extensive experimenter in synchronous and other multiple telegraphs; and this work is an account of what he has done in obtaining independent telegraph circuits by the use of direct and alternating currents on the same wire, and in the use, for telegraphing, of synchronous rotation of two bodies at distant points. His arrangement for using direct and alternating currents on the same wire is called the duplex-duplex system. He describes in detail the arrangement of such a system on the railroad wires of the Pennsylvania Lines West of Pittsburg between Pittsburg and Toledo, and also between Cambridge, Ohio, and Crestline. This line has been in use over three years. The duplex-duplex cannot be worked quite so long distances as the polar duplex, but it

\**Poor's Manual of Railroads*; 38th annual number, covering 1904. 1,620 pp. *Poor's Railroad Manual Co.*, Publishers, 68 William St., New York. Price, \$10, including delivery.

has the advantage that two messages may be sent simultaneously in the same direction, and the receiving operator can break the sending operator. The two independent circuits of the duplex-duplex system may be treated as if they were two separate wires, and rented or leased to independent parties. No artificial line is required for this system and stations may be inserted anywhere in the wire without putting in a repeater station.

*Handbook of Cost Data.* By Halbert P. Gillette. New York: Myron C. Clark. 1905. Leather, 610 pages. Price, \$4.

There is a distinction between "costs" and "prices" which many engineers and business men fail to recognize. Prices of material can be obtained anywhere at any time, but the cost of a piece of work is a very different thing. The price of material is only one small item in the cost. There have been many compilations of prices of material, so-called cost of excavation or building, etc.; and these have a certain value to the engineer and contractor in estimating the cost of a new piece of work. They all lack, however, an intelligent analysis of the component items, and therefore are of comparatively little use unless supplemented with a wide knowledge of practical work and years of experience. And too, prices vary from month to month in the same and different localities.

The author of this handbook has gone deeper into the subject of estimating costs of engineering works. An authority himself with every facility for collecting data covering a wide range of work, he has condensed in this volume the experience of practical men, the actual costs and prices of doing contracting work, and has analyzed these costs in a thorough and complete manner. The section headings give an idea of the subjects covered. They include cost keeping and preparing estimates; costs of earth excavation, rock excavation, roads and pavements, stone masonry, concrete construction, water works, sewers and conduits, piling and timber trestles, erecting buildings, steam and electric railroads, bridge erection, railroad surveys and miscellaneous structures.

The first chapter on cost keeping and preparing estimates is well worth careful study by any young engineer or contractor, for it is carefully written and contains just such information as cannot be found in text books on the practical details of this important preliminary to engineering contracts. More delays and actual monetary losses can be incurred by hasty and erroneous estimates than by any other conditions affecting the work, and the rule of thumb is not a safe and "good enough" method. The materials for the other chapters have been gathered largely from the author's personal experience and from data published in recent issues of the various engineering papers. Numerous examples are given of detail costs of works in different sections of the country, and wherever possible the figures have been supplemented by a brief description of the methods used on the work.

*The Building Estimator.* By William Arthur. Second Edition. Omaha, Neb., 1905. Published by the Author. Cloth, 186 pages. Price, \$1.50.

This little book was first published in 1904 and has since been added to and revised by the author in places where it seemed deficient. It outlines in detail the estimates necessary for figuring the cost of a complete building from cellar to roof, giving quantities, costs of materials, cost of labor, etc. Most of the examples have been taken from buildings erected under the author's observation, but the detail costs are sufficiently representative of conditions obtaining elsewhere throughout the country to be of value outside. Complete estimates are given for frame engine houses for railroads, and several pages are devoted to the cost of railroad shop buildings and other structures.

*Theory of Structures and Strength of Materials.* By Henry T. Bovey, Professor of Civil Engineering, McGill University. New York: John Wiley & Sons, 1905. Fourth edition, revised and enlarged. Cloth, 981 pages, 943 figures. Price, \$7.50.

It is not necessary to review at length Prof. Bovey's text book on Framed Structures. His work has long been a standard in many colleges and a constant reference book for many practising engineers. In its new and enlarged form it is brought up-to-date by the introduction of examples of modern engineering works throughout the discussions in the text. About 130 pages of new matter have been added and the number of figures increased from 515 to 943. This in itself speaks for the amount of work which has been done in revising the book.

*High-Tension Power Transmission.* Published by the McGraw Publishing Co., New York, 1905. Cloth, 466 pages. Price, \$3.

In 1902 the American Institute of Electrical Engineers appointed a committee of five members to collect data on the electric transmission of energy at high voltage and present it to the Institute in the form of a report and through individual papers. In this volume the various papers and discussions before the Institute relating to high-tension transmission have been collected and arranged in co-ordinate form. The papers have been reprinted from the *Transactions* of the society by special permission, and in this shape they form a valuable addition to engineering works relating to the modern method of transmitting energy great distances.

## TRADE CATALOGUES.

*Locomotive Castings.*—Illustrations of Hunt-Spiller gun iron locomotive castings, such as journal boxes, brake-shoes and wedges, cylinder packing and bushings, piston valves, false valve seats, girders, crosshead shoes, eccentrics and straps, rocker boxes, etc., are shown in a pamphlet published by the Hunt-Spiller Mfg. Corporation, South Boston, Mass. This metal has a tensile strength of 35,000 lbs. per sq. in., and is of very close grain and has exceptionally fine wearing qualities which make it particularly desirable for locomotive work. W. B. Leach, General Manager of the company, was at one time connected with the Boston & Albany.

*Union Pacific Motor Cars.*—Union Pacific motor cars numbers 1 and 2 are described, with photographs and drawings of the newer car, in a folder just issued by the road. The description includes a record of trial trips and regular service in which the cars have been used. In its second trial run on September 22, motor car No. 2 covered several miles at the rate of 63.2 m.p.h.

*The Chicago, Burlington & Quincy* is distributing a folder of 15 pages devoted to Colorado as a winter resort. It is illustrated with large half-tone engravings from photographs and sets forth in detail the advantages and desirability of this region in the winter season.

*Belt-Type Direct Current Machines.*—Large sizes of belt-type d.c. motors and generators are described in Bulletin 61, issued by the Crocker-Wheeler Company, Ampere, N. J. Outlines of these machines accompanied by tables of general dimensions are also given.

## CONTRIBUTIONS

### "Praise from Sir Hubert."

Atlanta, Ga., Nov. 15, 1905.

TO THE EDITOR OF THE RAILROAD GAZETTE:

I have just been reading the last issue of the *Railroad Gazette*, and feel like saying something to show my appreciation of its make-up and the character of the articles printed. What could be neater, cleaner or plainer than the pictorial description of the article on the Improvements of the New York Central & Hudson River? It seems to me that careful perusal of its columns from week to week is almost equivalent to a liberal education for any one who wishes to be well informed on railroad matters, and almost invaluable. The clean cut, plain, common-sense statements and liberality of view in its editorials particularly impress me. Especially so in the one referring to Mr. John F. Wallace in the issue referred to. I do not know him personally, but it has seemed to me that if ever a man of merit was unjustly treated, he was. Yet he has proved himself to be too much of a man to let the "slings of outrageous fortune" prevent his aiding the Advisory Board of the Canal Commission with his valuable information in reaching their decision, and the *Railroad Gazette* is certainly to be commended for speaking plainly about the matter.

BENJ. THOMPSON,  
Mem. Am. Soc. C. E.

### Honeycombing Flue Sheets.

Omaha, Neb., Nov. 13, 1905.

TO THE EDITOR OF THE RAILROAD GAZETTE:

I have read with interest your editorial note in the issue of October 27 calling attention to the formation of honeycomb on flue sheets of locomotives burning Illinois and Iowa coal with automatic stokers. We have had considerable experience, particularly on our Kansas division, with the honeycomb or clinker forming on our firebox plates, especially the back flue sheet. In my opinion, the automatic stoker has nothing to do with the clinkering of the flues or the firebox plates. It is entirely in the coal; this formation is a part of the coal. Owing to our engines on this division having small grate area and consequently small exhaust nozzles in order to burn the coal mentioned, the small nozzles create a high velocity of air drawn through the grates, which carries this substance from the fire to the flue sheet. With a wide firebox and larger exhaust nozzles, this does not take place to such an extent. This substance will cover the flue sheet in going from 30 to 40 miles. To remove it, the fire door is opened, blower put on, and a rush of cold air striking the clinker hardens it so that it can be knocked off. Where an automatic stoker is used the scraper cannot be used and an engine would fall on account of this clinker covering the flue sheet and shutting off the draft.

We have tried sand in fireboxes to prevent this formation, but with no beneficial results. At the present time we are experiment-

ing by giving the ends of the flues and flue sheet a coating of plumbago and oil, before the engine leaves the roundhouse. We find that, when the ends of the flues are new and smooth, this clinker does not adhere as readily as after the flues have been in service a few months and the ends become rough. In view of this fact, it has been suggested that the coating of oil and plumbago will have a tendency to keep this surface smooth and prevent the clinker from adhering.

W. R. M'KEEN, JR.,  
Superintendent M. P. & M., Union Pacific.

### Handling Fast Freight in England.

In connection with the series of articles we have printed on the time freight systems of representative American railroads, it is of interest to glance at the extraordinary and extravagant development of that type of traffic in England. As far back as 1885, when Hadley wrote his "Railroad Transportation," he spoke of the fact that merchandise freight could be collected from the shipper in the afternoon and delivered at almost any large point south of the Scotch line early the following morning. So far as the main principles involved are concerned, there has been no radical change during the last 20 years, but in the working of the traffic, in the face of sharp competition, the service has been polished up to a degree of facility and of expensiveness which strikes the American observer as quite extraordinary. Broadly speaking, the British railroads are not troubled by competition in rates, although in certain specific cases, as, for example, the passenger traffic between Glasgow and Edinburgh this statement must be modified somewhat.\*

But on the main trade routes, as, for example, between London and the north, there is the sharpest kind of competition in facilities. What competition in facilities does in this country is well shown on the roads working between Chicago and St. Paul and Minneapolis. In England, however, the development at the expense of the carrier has been much greater, particularly in handling freight. There are three main routes from London to Scotland, the London & North Western, which combines with the Caledonian to furnish a through service; the Midland and the Glasgow & South Western, forming the central route, and the Great Northern, North Eastern and North British, forming the east coast route. Although, in general, these lines serve the west, center and east of England, respectively, they nevertheless compete at many points and have additional rivals of their own; as, for example, the Great Western and the Great Central. The result is that the London & North Western despatches from its Broad Street Station in London about 28 fast freight trains every afternoon and evening. These trains, in their unity and in the way they are handled, suggest a passenger service rather than a freight service. Their length is quite uniform, consisting of either 24 or 25 goods wagons. The traffic handled includes about everything except coal, brick, iron, and other heavy articles, but merchandise predominates, with the result that three tons per wagon of paying traffic is considered a first rate load. The Great Northern despatches 16 of these trains every night, each train made up of 24 wagons, so that the net paying load per train is only 72 tons, and this is adhered to in practice quite strictly. Each one of these trains has its regular place in the loading sheds, which also suggests the working of a passenger service.

At the Broad Street Station the cars are handled individually by lines passed around hydraulic capstans, over tracks making right angle junctions in the shed, with a turntable at each junction. The capstans are conveniently located, operated by a foot lever, and revolve at a high speed, and a crew of two men handle the cars with great skill and rapidity. Loading and unloading is done on two floors, and the cars are raised and lowered on hydraulic lifts without confusion or loss of time.

Perhaps no more graphic exhibit of the nature of English freight traffic could be shown than the accompanying statement of the business done at a large goods station on a single day selected as characteristic.

STATION R. X.  
Consignments and Packages in One Day.  
Received.

Description of traffic.	No. of—		Weight—		
	Consignments.	Packages.	Tons, of	Per consign-ment, lbs.	Average Per package lbs.
Meat .....	206	6,082	337	3,669	40
Fish .....	81	2,233	31	842	30
Ale .....	1	85	18	40,320	429
Goods .....	2,574	24,002	499	404	46
Total .....	2,862	32,412	886	692	61

Forwarded.

6,201 consignments.  
23,067 packages (total weight 906 tons).  
Average weight per consignment, 297 lbs.  
Average weight per package, 88 lbs.

The interesting corollary to these figures is that a large proportion of the 32,412 packages received had to be delivered before

\*The distance from Glasgow to Edinburgh over either of the competing lines, the North British or the Caledonian, is approximately 60 miles, and the single third-class fare at the prevalent rate would be about 5s.; as a matter of fact it is only half a crown (2s. 6d.).

eight o'clock in the morning, while the 23,067 packages forwarded were, for the most part, receivable after four o'clock in the afternoon.

On another day, from this same station, when a total of 823 tons of goods were sent out, 718 tons were loaded direct for delivery at 161 stations, and 105 tons were sent to 105 "tranship" stations for delivery at 528 points! Of the stations served direct, only 21 received consignments of over seven tons; the remaining 140 received 439 tons of freight in consignments smaller than seven tons.

The Great Northern undoubtedly handles its merchandise traffic faster than any other line in England at the present time. The 16 nightly trains are sent out at an average speed, including stops, of 40 to 45 miles an hour. On the North Western the speed of these trains is somewhat less, say, 35 to 38 miles an hour, and the same is true on the Great Western, which competes sharply with the North Western for part of its traffic. As a result of this type of service, which has been accelerated and improved with each succeeding year, the business methods of the local tailor or draper have gradually changed their character, and only small stocks are carried. For example, a customer in Sheffield orders a suit at his tailor's from the sample; the tailor telegraphs to London for the cloth, and if he receives his order by four or five o'clock in the afternoon, he gets the cloth delivered at his shop by his opening hour the following morning.

To handle traffic in this way is, of course, extremely expensive for the railroad companies, but the rates charged are proportionately high and the best opinion at the present time seems to be that this abnormal traffic is profitable. The average rate received for this fast freight for the average haul is not far from a sovereign (\$4.86) a ton. This, of course, includes collection and delivery by the railroad company. Southbound traffic arriving in London in the early morning hours is switched on to the Metropolitan and District underground line and brought from the main receiving stations at the north of London to the freight depots east of the City. Here it is received in the company's own vans for immediate delivery, which is, of course, facilitated by the small loading of the cars. In former times rather more use than at present was made of the great public trucking companies in London, such as Pickford's. The railroads now find it cheaper to handle their own goods, but call on the trucking companies for help in times of emergency, on an agreed rate.

In view of the light weight of these fast freight trains and of the speed at which they are run, it is not surprising to find that they are frequently handled either by regular passenger locomotives or by a type approximating the regular passenger type. The fastest freight trains of all are those carrying fish, chiefly from the east coast receiving points, such as Grimsby and Hull, to the markets. England is a great fish-eating country, and the importance of having the fish delivered in the quickest possible time is fully realized; hence the fish trains running in the early morning hours are in many cases the fastest trains on the road, passenger or freight, and will maintain a schedule of 60 miles an hour or faster. These trains carry a special system of designation and are kept intact for the trade.

It is obvious that with the short hauls and fast running there is but little need of the complicated time freight accounting which is required in this country. On a characteristic English line the general superintendent receives each morning a telegram describing the movement of each of his fast trains on the night before. This telegram is usually quite simple, because the traffic is but little subject to delays and breakdowns. The trains move with great punctuality and the ordinary record is simply that the enumerated trains as specified have been despatched from enumerated points and have arrived at London. The exceptions are so few in number that they can be handled at once and cleaned up without any further formality.

Assuming the tare weight of each of these merchandise goods wagons as being in the vicinity of 5½ long tons, it will be seen that the weight per train is not far from 228 tons of 2,000 lbs.

The heavy freight trains, carrying brick, coal, iron, etc., are also despatched considerably faster than the corresponding trains in American service, though far lighter. The Great Northern has in some cases hauled mineral trains, as it calls them, weighing 1,000 tons of 2,240 lbs., but these are very uncommon and are not attempted on most of the lines. The London & South Western considers 400 tons as its practical maximum and handles these trains at 20 miles an hour, average running, including stops, with six-coupled engines; and 400 tons is in general pretty good measure for British mineral trains, except for special runs on the great coal roads, the Lancashire & Yorkshire and the North Eastern, and for occasional experimental developments like that on the Great Northern. Large cars, except under extraordinary circumstances, are evidently an unprofitable specialty in England at present. On the line of the London & North Western alone, at the present time, there are nearly 100,000 private owned colliery wagons in use. The company can insist that these be safe, serviceable, and not ridiculously small (from the English standpoint), but cannot

require the owners to use big cars. The mineral tariff usually covers haul alone, without including vehicles, and the private wagons and private loading facilities govern the traffic.

The discussion of heavy freight, however, does not properly come within the scope of the present paper, except so far as is necessary to show that practically everything except traffic of extreme bulk and low value is included in what we would consider the time freight designation. On lines such as the London & South Western, which have a less exacting competition, only a few fast goods trains are run, two or three each day carrying the meat and fish, fruit, etc., at about 40 miles an hour; and the standard train, as on the other lines, consists of about 25 cars hauled by an engine with wheel arrangement often corresponding to our Atlantic type, weighing 80 to 90 long tons, including tender. On this line draperies, etc., are hauled in the general goods train, as distinguished from the mineral trains. These general goods trains consist of about 40 cars with a total weight of about 400 tons, and they are hauled at approximately 35 miles an hour with only one or two stops between London and the West. All of these trains preserve their schedules, the main difference from the lines to the North being that a much smaller number of fast freights are worked, while the intermediate traffic is carried in mixed freight trains.

On the southern lines, such as the South Eastern & Chatham, where the goods business is secondary, consisting chiefly of continental merchandise which has crossed the Channel, and of the out-haul to the towns along the line, only one or two fast trains are run each day, and these are extremely small, pulling out with from five to 15 cars, so that the average paying load per fast freight train would not be much more than 30 tons per train. These trains run about 40 miles an hour and general freights, as on the South Western, carry the balance of the traffic in 400 ton trains, gross load, at about 35 miles an hour. Mineral trains on the South Eastern & Chatham also maintain about this speed and are usually quite light. The important consideration is to keep them out of the way of passenger trains.

What the competition in facilities which has brought about these developments will lead to, no one can tell. English railroad managers are quite agreed in their belief that only a tiny fraction of the shipping public has really any vital interest in the over-night deliveries that are arranged at such cost. On the other hand, it may be said that freight rates have scarcely been reduced in the last 30 years, and it is presumably more profitable to the companies to haul their traffic in uneconomical train loads and haul it fast, at high rates, than to increase the loading and lower the rate.

#### The Fades Viaduct.

BY E. OMMELANGE.

The Fades viaduct which is being built across the valley of Sioule river near Vauriat, France, will be the highest railroad bridge in the world. It is one of the engineering structures on a branch line from Saint Eloy to Pauniat (Puy du Dome), in Central France. The total length of the bridge is 1,446 ft. 2 in., and it consists of three masonry arch approach spans and three latticed girder deck spans. The level of the rail is 434 ft. 7 in. above the bed of the stream. The steel spans are of unusual length for the type of truss used, the center span being 472 ft. 5 in. over end pins and the two flanking spans each 378 ft. long. The masonry towers are also remarkable. The bridge will cost about \$560,000, of which \$200,000 has been spent on the masonry piers and abutment arches and the remainder for the steel work.

The two tower piers are of granite masonry laid in parallel courses and are 303 ft. high above the foundation, which rests on solid rock. They are rectangular in section with parabolic facings, the reduction in dimensions being from 38 ft. 3 in. x 72 ft. at the base to 18 ft. x 36 ft. under the capitals. The piers are hollow and have two shafts rectangular in section rising to the top and connected under the capitals by a circular arched opening. The narrow dimension of these shafts, 6 ft. 6 in., is constant for the full height, but the long dimension decreases with the height. The walls thus have a thickness of from 15 ft. 9<sup>3</sup>/<sub>16</sub> in. to 6 ft. 1/4 in. on the narrow faces of the pier, and from 21 ft. 3 in. to 11 ft. 9<sup>3</sup>/<sub>4</sub> in. on the wide faces. The coping at the top is 9 ft. 10 in. high and projects out 2 ft. 11 in. from the faces of the shaft. It is supported on brackets and fillets which give a finished appearance to the immense pillars.

The west approach is formed by two circular masonry arches of 45 ft. 11 in. span. The end piers are 16 ft. 5 in. thick at the springing line, and the intermediate piers 9 ft. 2 in. thick. The outer pier is 264 ft. 9 in. high from foundation to springing line and the inner pier is 76 ft. high. The approach arches are 32 ft. 2 in. wide over parapets. A buttress is built up on the outer face of the approach pier to serve as a seat for the superstructure. It is 6 ft. 6 in. wide and 29 ft. 6 in. long at the top. The east approach has only one masonry arch of the same dimensions as the piers and arches of the west approach.

The superstructure is 1,230 ft. long divided into two shore spans of 379 ft. and a central span of 472 ft. It consists of two parallel latticed deck girders 38 ft. 2 in. deep spaced 21 ft. 11 in. apart, center to center of chords. The top and bottom chords are built up of plates in a box section and the double lattice rods are inclined at an angle of 45 deg. The two girders are braced laterally with diagonal and cross-braces. The top chords carry the floor system and the bottom chords carry a fixed footbridge for inspection and maintenance purposes.

The floor system consists of I-beams spaced 2 ft. 4 in. apart and resting on the top chords of the trusses. A steel plate floor 1/4 in. thick is laid over these and the rails are laid on the plates. The floor is designed to carry a locomotive or cars in the event of their leaving the rails and wooden guard rails are laid outside the track rails to keep the engine or cars in the center of the structure should a derailment occur.

The superstructure was designed to carry a dead load uniformly distributed of 4,220 lbs. per ft. and a live load of two 77-ton locomotives followed by a train of 20-ton coal cars. The coal cars are 25 ft. 2 in. long and are carried on four wheels with axles spaced 10 ft. apart. The maximum axle load of the cars is 16 tons. Wind pressure was taken at 34.8 lbs. per sq. ft. of vertical sur-

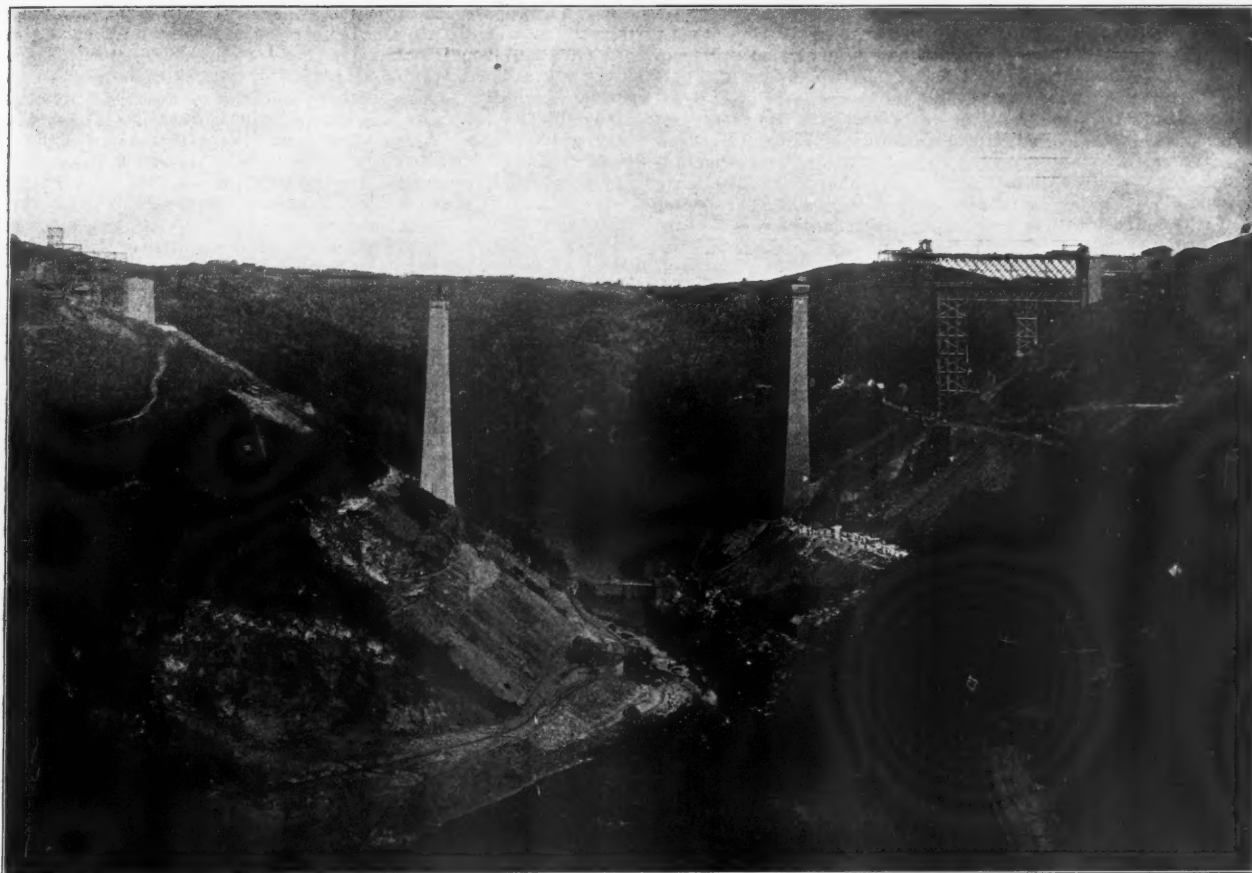


East Pier of Fades Viaduct.

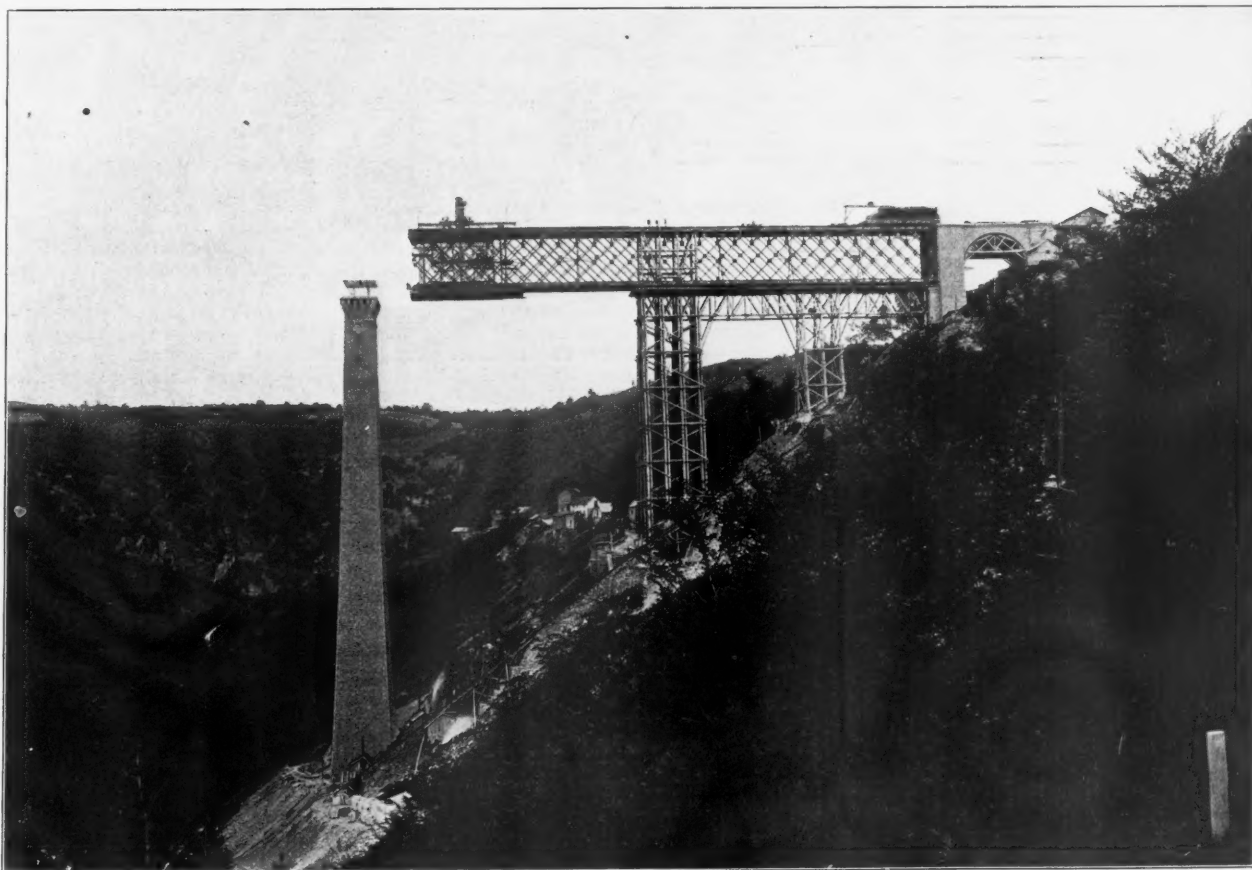
face for the loaded bridge and 55.3 lbs. per sq. ft. for the unloaded bridge. These pressures were assumed to act only on the actual vertical projection of the trusses. The full wind pressure was assumed to act on the windward truss and the simultaneous pressure on the leeward truss was less by that fraction of the full pressure equal to the ratio of exposed truss surface of one truss to the total area of the rectangle represented by the top and bottom chords. The wind pressure on a train was assumed to act on a vertical surface 9 ft. 10 in. high with its bottom edge 1 ft. 8 in. above the rail. The maximum wind effect was found to be 941 lbs. per lineal ft.

The pier carrying the fixed end bearing is further required to resist the braking effort of the full train load. It was assumed that the maximum train load with full complement of automatic brakes would be 330 tons, which would give, with a braking coefficient of 0.20, a retardation of 66 tons. The maximum compressive stress in the piers due to full dead and live load and wind load is 200 lbs. per sq. in. Calculations to determine the lateral deflection of the piers at the top due to wind load and braking load showed that this would be only about 1/4 in. under the most severe conditions.

The end bearings of the trusses are of the usual pin and roller



The Sioule River Valley and the Fades Viaduct.



Erecting East Shore Span of Fades Viaduct, Showing Falsework and Traveler.

type. The fixed bearing is mounted on the east pier. Those on the west pier and the two abutments are movable.

The erection of the superstructure has been carried out from the east bank. A scaffold floor supported on two towers and half the length of the shore span was built up to the level of the bottom chord of the truss and half the truss erected. The remainder of the first span was erected with a traveling cage carried out on the truss as the erection proceeded. The inshore end was counterweighted with 200 tons placed next to the abutment. A similar method will be followed with the west shore span. The center span will be erected with a traveler by anchoring to the inshore spans. Most of the field riveting is being done with pneumatic hammers, but in a few inaccessible places hand riveting has been used.

#### Improvements of the New York Central & Hudson River Within the Electric Zone.\*

The new Grand Central yard, Park avenue tunnel changes, Port Morris Branch improvements, Marble Hill cut-off, four-tracking and electrification have been described in previous articles (*Railroad Gazette*, October 20, November 3, 10 and 17). This article, which concludes the series, will describe the new terminal building which will be erected on the site of the Grand Central Station.

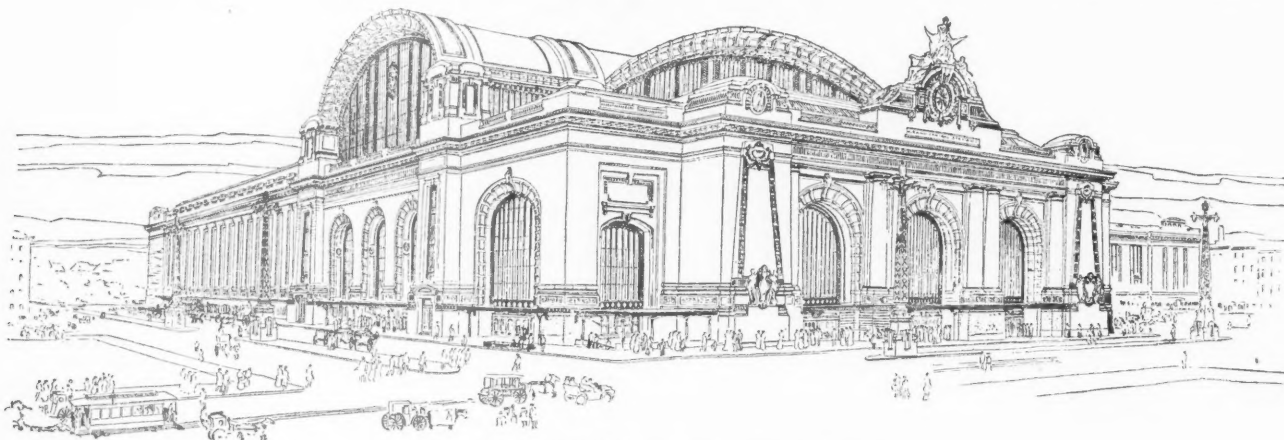
Preliminary studies for the new station were developed on the basis of a structure suitable for revenue producing qualities as well as for railroad uses, following substantially the lines of a modern high office building. This plan was later discarded, however, as sacrificing to commercial uses, features of great importance for railroad requirements, and as being less adapted to treatment appropriate for a great railroad terminal.

The accepted design embodies a monumental scale of treat-

below and approached from the gallery by four grand staircases, each 25 ft. wide. This concourse is on the same level as the express tracks, about 15 ft. below the street grade. It will be 160 ft. by 470 ft. and over 150 ft. high, and will be the largest in the world. Passageways of generous dimensions have been provided, connecting both ends of the concourse by means of subways with easy grades, with Madison and Lexington avenues, the exits on these avenues being just north of Forty-third street. A passageway is also provided connecting the west end of the concourse directly with the Rapid Transit Subway Station in Forty-second street. The main exit from the station is at the west end of the concourse, opening directly to Vanderbilt avenue opposite the public carriage stand, or to the company's cab stand below the street level.

North of the main concourse and on the same level, are the express platforms in the main train room. This train room is 500 ft. wide by 400 ft. long, extending from the west side of Vanderbilt avenue to the east side of Depew place, and north to Forty-fifth street. It contains 24 tracks and 13 platforms, 15 to 18 ft. wide, the longest of which extends to Forty-ninth street, a distance of nearly 1,500 ft. The low vaulted roof of the train room is supported along the platforms by columns which also carry the building over the train room. On the same level and to the rear of the express concourse is the general waiting room under the ticket lobby. Adjoining the express concourse and the main waiting room, are the usual retiring rooms, cafés, restaurant, parcel room, barber shop, telephone and telegraph facilities, etc. The main waiting room and express concourse with adjoining rooms and the express train room, occupy the entire area, about 15 ft. below the street grade, from Forty-second to Forty-fifth streets, between the west line of Vanderbilt avenue and the east line of Depew place, 720 by 460 ft.

From the express concourse grand staircases descend to the lower level or suburban concourse, with separate waiting, retir-



Elevation of Proposed New Grand Central Station.

ment. Rising only to a height of 170 ft. above the street, the structure as a whole appears low on account of the tremendous scope of the plan, which covers an area equivalent to about 3½ city blocks. The main entrance on the Forty-second street facade, symmetrical with the center line of Park avenue, presents three arched entrances of proportions commensurate with the general scale, flanked by huge pylons on which appear appropriate inscriptions, the whole surmounted with a heavy ornate cornice which extends unbroken around the entire building. Over the center arch is an immense ornamental clock which is surmounted by a group of statuary. The Vanderbilt avenue facade provides similar treatment for the main exit, the three arches being symmetrical with the center line of Forty-third street and being surmounted by a grand arch sprung from the flanking pylons and spanning the entire exit. This arched roof is carried for the entire width of the main building from Vanderbilt avenue to Depew place, forming a roof to the main concourse, and intersected in the center to effect a magnificent groined dome over the center of the concourse.

The station will be set back about 40 ft. from the line of Forty-second street and 70 ft. from the line of Vanderbilt avenue, and island walks with tall electroliers will follow the existing street lines, thus giving spacious carriage approaches to the main entrance and exit.

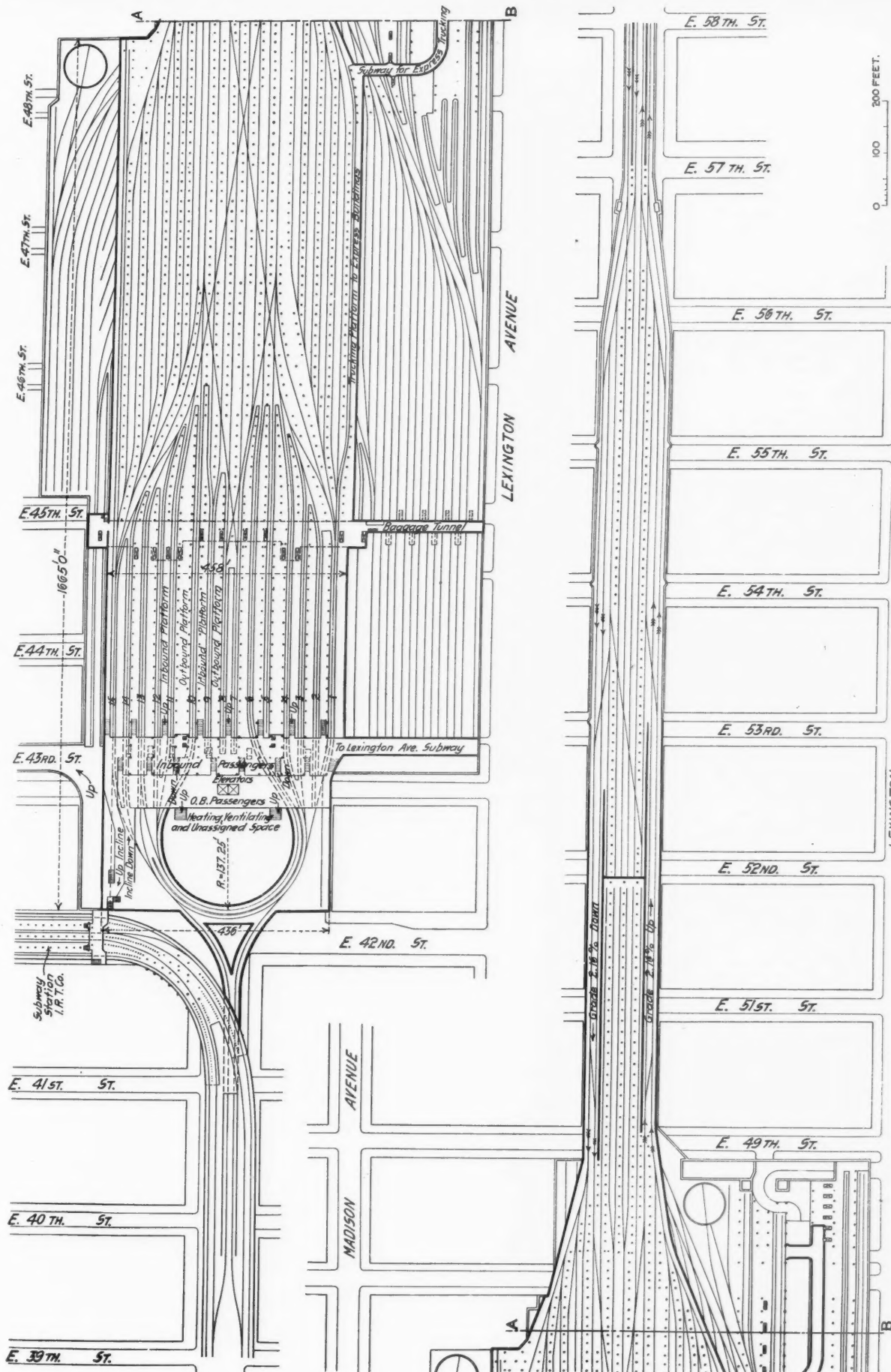
From the main entrance from Forty-second street passengers enter the ticket lobby, a hall 90 x 300 ft., at the street level, extending the entire width of the main building, with vaulted roof. The outgoing baggage room along Depew place is in direct communication with the ticket lobby and is thus convenient to passengers for checking baggage after tickets are purchased. Beyond the ticket lobby and on the same level is the gallery or mezzanine floor surrounding and overlooking the express concourse 15 ft.

\*By G. R. Wadsworth, late with the New York Central.

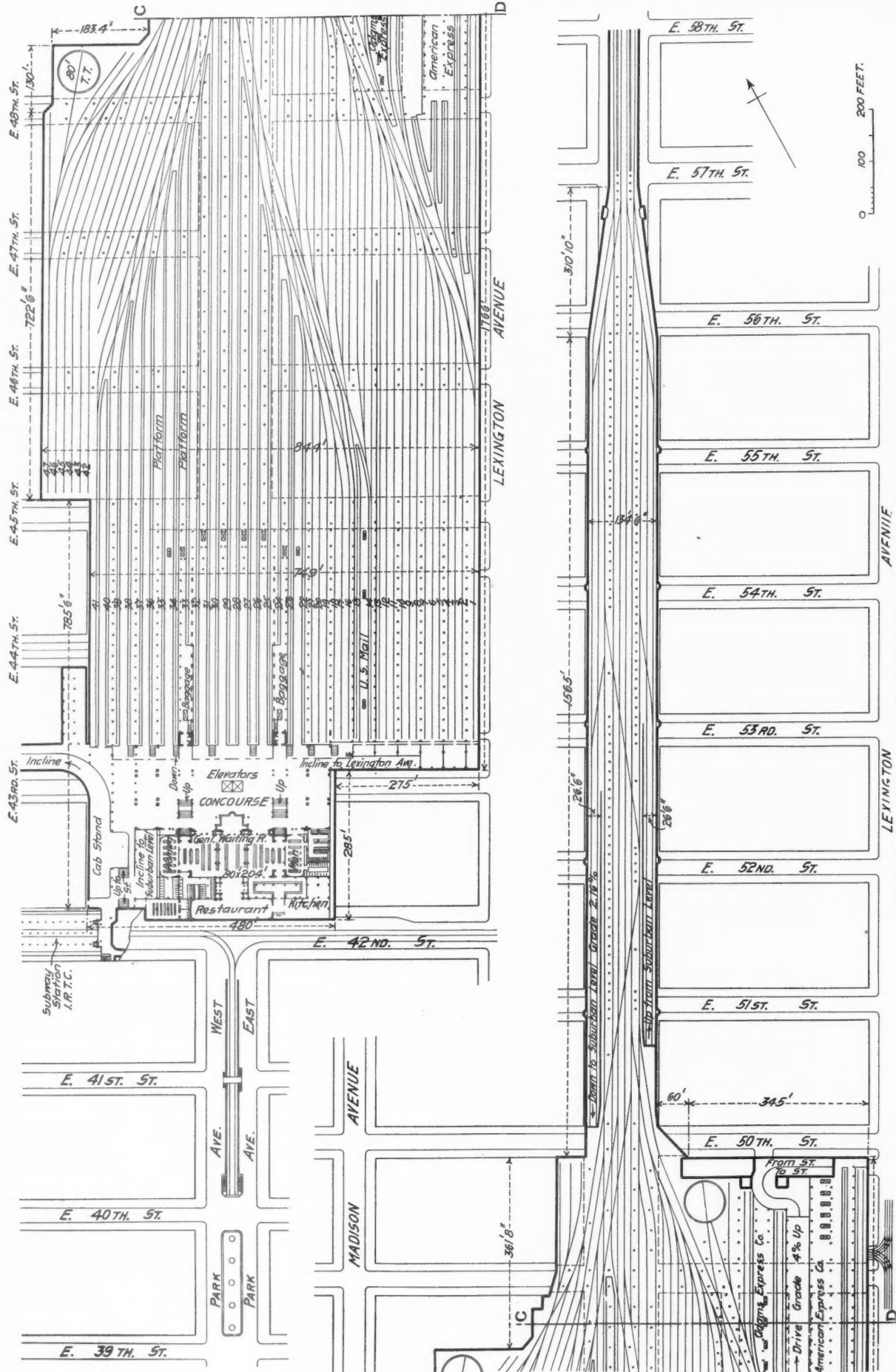
ing rooms, etc., which are on the same level with the suburban platforms. The suburban concourse is about 80 by 300 ft. and from it passengers can pass directly forward to the suburban platforms, or to the rear to the passageway leading directly to the Rapid Transit Station in Forty-second street. There will be provided also separate entrances and exits to and from the suburban concourse, leading by inclined passageways directly to the street, and obviating the necessity of passing through the express concourse to the main entrance or exit. The platforms in the suburban station are 500 ft. long.

The suburban station comprises 16 platform tracks. Each track is served by two platforms, one for loading and one for unloading, so that every alternate platform throughout the entire width of the station is used exclusively for incoming or outgoing passengers. The stairways and passages leading from the concourse to the suburban platforms are so arranged as to be used exclusively for outgoing passengers, thus obviating all confusion, the incoming platforms leading directly to the waiting room, the subway station or the exits.

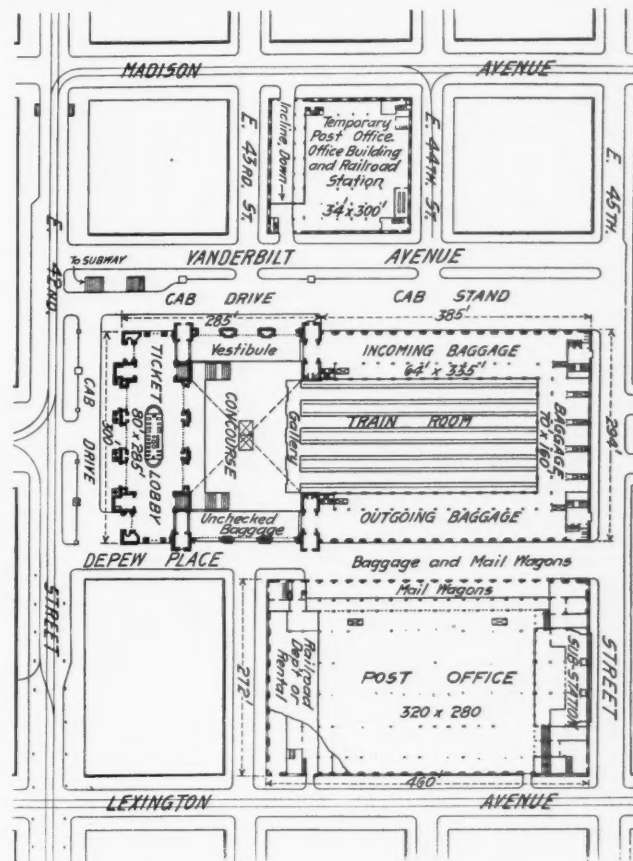
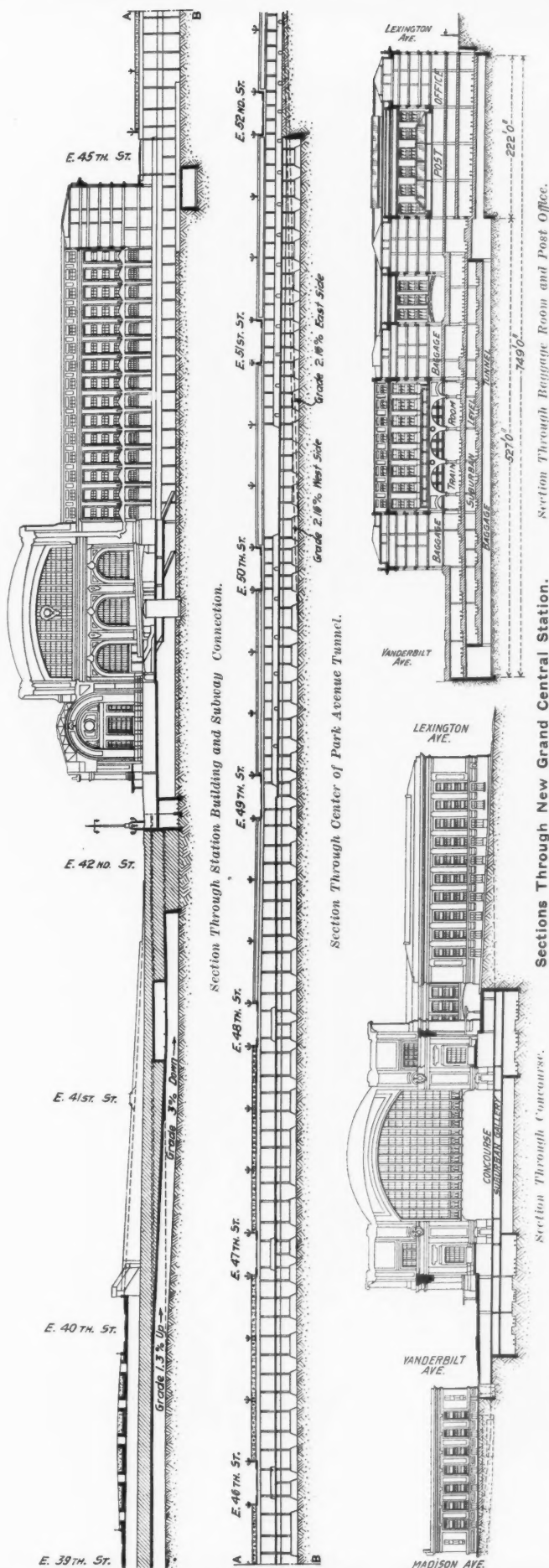
The baggage rooms will be located slightly above street grades, and will have a continuous street frontage for wagon service, of about 1,300 ft. The incoming baggage room will be along Vanderbilt avenue from Forty-third to Forty-fifth streets, and the outgoing baggage room along Depew place from Forty-second to Forty-fifth streets. The two baggage rooms are connected at the extreme north end of the station building by a baggage concourse at the same level, passing over the tracks and along the south side of Forty-fifth street. Consideration was given to the automatic conveyor system for handling baggage from the train to the baggage rooms, with a view to its possible adoption. The conclusion was reached, however, that admirable in itself, the system was not well adapted to Grand Central Station requirements, on account of the



Track Plan of New Grand Central Station at Suburban Level.



Track Plan of New Grand Central Station at Express Level.



consequent sacrifice in the number of tracks in the train room, or in the width of the platforms, in order to provide suitable space between the tracks in pairs for the conveyors. Baggage will be trucked on the passenger platforms, but away from the passenger concourse, to elevators connecting each platform, both in the express and in the suburban station with the overhead baggage concourse. Certain elevators serve jointly the express and the suburban platforms immediately below.

The company's cab stand will be on a level with the express train concourse, and occupies a space 100 x 200 ft., immediately under the street surface of Vanderbilt avenue at the end of the concourse. The cab stand is reached by an easy incline from Madison avenue just north of Forty-third street. The public carriage approach for arriving passengers is on Vanderbilt avenue, opposite the main exit.

It will be noted that the main exit as well as the inbound baggage room is on the west side of the station, providing for right hand operation of trains with the new electric service.

Over the main train room and the baggage rooms, from the main concourse north to Forty-fifth street, for the full width of the station, will be the railroad offices. This portion of the building will have a street frontage of about 1,000 ft. on Vanderbilt

### A Study in the Cost of Carrying Live Stock and in the Cost of Car Service.\*

The division of rate which the lines east of the Missouri river accept for transporting live stock, and the division of the rate accepted for transporting the products of animals as they now exist, are in line with the holdings of the Interstate Commission, viz.: that the rates per cwt. on live stock should probably be less, but in no event should they be more, than the rate on the products of live stock, as shown by the following schedule of rates which have existed for several years on cattle, hogs, packing house products and fresh meats from the market towns of Kansas City, St. Joseph and Omaha to the market town of Chicago—i.e., from market to market: Cattle, from 14 to 22 cents; hogs, from 16½ to 22 cents; packing house products, 20 cents; fresh meats, 20 cents.

The rate on both cattle and hogs is the actual difference between the rates from the point of origin to Chicago, and the short rates from points of origin to the Missouri river, which gives varying rates from the Missouri river markets to Chicago on live stock. The rate on the product of animals is a fixed rate, but based upon the average of the varying rates, in effect the same principle.

It is now my purpose to show by analysis that such divisional rates are not equivalent rates, based on the cost of carriage, but that the live stock rates are too low, and that as a matter of fact live stock rates, based on the cost of carriage, instead of being less per cwt. should be more per cwt. than the rates on the products of live stock.

For convenience, I will use the average of the varying rates on live stock, which would be 18 cents per cwt. on cattle and 19½ cents per cwt. on hogs. It costs as much to haul a ton of car as a ton of its load, and as live stock is hauled in cars whose average weight on the Chicago Great Western line is 27,500 lbs., and the product is hauled in refrigerator cars having a weight, including ice, of 41,000 lbs., and as the average load of cattle is 21,513 lbs., of hogs only 16,635 lbs., of packing house products 31,632 lbs., and fresh meats only 22,414 lbs., these varying weights of car and load must be taken into consideration. Then there are certain burdens which pertain to the transportation of live stock, which do not pertain in the same degree to the transportation of the products, which must also be taken into the account before the true comparison of cost can be made. In the analysis, I will speak of these unequal burdens first.

The packing house products and fresh meats are not hauled in cars owned by the railroad, but in refrigerator cars owned by the packers, and the expense which is most talked about is the mileage paid for the use of the refrigerator cars. In order to understand this mileage arrangement, it must be borne in mind that the mileage paid covers the use of the car and its interest account, and the entire cost of renewals and the cost of repairs to such refrigerator cars "necessitated by ordinary wear and tear in fair service." In addition to the mileage, the railroad company pays "for damage done to any of the cars by unfair usage, derailment or accident," which on the Chicago Great Western in the year 1905, averaged one mill per mile. The mileage paid is one cent per mile, making the total payment for use of car, renewals and repairs 1.1c. per mile. The packers own these cars; they load them and unload them, and cars not required for use between Chicago and Missouri river points can be used in distributing packing house products over other lines. So the cars are loaded and unloaded promptly and kept almost continuously in motion, which enables them to make a much larger daily mileage than it is possible for railroad companies to make with their own cars. It is probable that the average mileage of these refrigerator cars is, approximately, 100 miles per day, while the average mileage of railroad cars of all descriptions is known to be about 22 miles per day, and the average mileage of stock cars is less than 22 miles per day. On account of superior administration, the packers make a profit (although not as large as is generally supposed) from the ownership of such cars, by leasing them on the terms mentioned. But (as I will show later) no railroad could make a profit on such terms. No railroad could maintain such superior administration, because, not owning the output (merchandise shipped from packing houses), or controlling its routing, one day it would be called upon to furnish a large number of cars, the next day few or none, with no way to tell in advance on what days the demand would be large; so that in order to supply the

largest day's demand a great many cars would stand idle on the days of smaller or no demand.

This proposition seems to be corroborated by the movement of stock cars, the actual loading and unloading of which consumes no more time than the actual loading and unloading of packing house products, and therefore it would appear that stock cars could be kept as continuously in motion between markets in the through stock transportation as the packers' refrigerator cars. But this is not the fact, for the reason, among others, that the amount of stock to be moved between such points is not, like the packing house products, approximately a constant quantity day after day. Some days and some months there is a large demand for cars; other days and in other months practically no demand whatever. Evidently the railroads must own cars enough to supply the largest demand. And as the railroad companies have no control over the routing of such live stock, they cannot tell in advance whether the live stock which is to be moved will be routed over their line or over the line of their competitors, so they can never tell in advance what the demand for cars will be from day to day. Therefore, a large number of stock cars are standing empty frequently for days, and even weeks, in succession, awaiting loads.

How irregular this movement is may be shown by the records of the Chicago Great Western Railway Company. The actual movement for last year of live stock from the South St. Paul stock yards to the Chicago stock yards was: July, 62 cars; August, 264; September, 240; October, 222; November, 195; December, 45; January, 57; February, 26; March, 17; April, 208; May 47; June 17; total 1,400 cars. More than half—726 cars—moved in the three months of August, September and October, most of which was live stock direct from the ranges. The total shipped from South St. Paul to Chicago during those three months [by all roads] was 7,374 cars. This stock came into South St. Paul from the west—some days 500 cars, some days none—and after its arrival commenced the scramble between the different railroad companies for its further shipment to Chicago. In the scramble the Great Western got about 10 per cent.

The shipments were just as irregular in respect to days of shipment as by months. The first day of August the Great Western got 13 cars; in the next six days six cars, or an average of one car per day; in the next day it got 17 cars; the next day 23 cars; the next 13 cars, and in the following three days none; and so on during the month.

The enormous waste, due to such irregular and uncertain movement, may be seen from the following astounding statement of facts:

The Chicago Great Western moved during the last fiscal year an aggregate of 15,134 cars of live stock an average distance of 197 miles, an average of less than 42 cars per day. It owns 686 stock cars, which would seem to be enough to move 42 cars per day an average distance of 197 miles. But, as a matter of fact, it had to rest, from private car lines, cars to move 54 per cent. of said live stock. That is to say—686 cars, under existing conditions, will move only an average of 19.74 cars of live stock per day an average distance of only 197 miles, equal to only 5.8 miles per day per car.

These stock cars were rented under the same conditions, in respect to repairs, maintenance and mileage, as the refrigerator cars, except that the mileage paid for stock cars was six mills per mile instead of one cent per mile. The cost of a stock car is about \$600, while the cost of a refrigerator car is about \$1,200.

Knowing that we were able to rent these cars at six mills per mile, and supposing that the private car lines found it profitable, in my testimony before the Interstate Commerce Commission, based upon this fact, without much investigation, I estimated that it cost the railroad companies in interest, depreciation and renewals about six mills per mile for the use of their own cars. But upon examination of actual accounts I find that the actual cost is much larger.

I find that the average cost of labor and material only of repairing the total freight equipment of the Chicago Great Western is about four mills per freight car mile. I am able to find data in only one report of the larger railroad companies, which I have been able to examine, upon which to make the same calculations, which gives practically the same result.

If it costs the private car lines as much to make their repairs it is evident their profits are not excessive.

There are conditions, however, pertaining to the private stock car mileage, which tend to increase their average daily mileage and therefore reduce the average cost per mile of repairs. For illustration: The stock cars which were rented by the Chicago Great Western were largely the cars which had been sent to be loaded at the western ranges, making long hauls—partly over the Great Western lines and partly on the Pacific lines—during the season of range stock movement, hence their average mileage would be larger than the average daily mileage of the railroad company's stock cars. And then between Chicago and the east they get long runs, which make larger daily average mileage than the railroad stock cars, and to this extent the cost of their repairs per mile

\*In the trial before the United States Court of the suit of the Interstate Commerce Commission vs. the Chicago Great Western and other roads, to compel compliance with an order of the commission concerning the rates on live stock, and on meats, Mr. A. B. Stickney, President of the Chicago Great Western, who testified concerning the practices on his road, presented an analysis of the relations of the rates on live stock to those on the products of live stock, based on the cost of carriage. The present article contains the main part of Mr. Stickney's statement and argument. His purpose, it will be seen, was to show that while the rates from Kansas City, etc., to Chicago on live stock are less than on fresh and cured meats, there would be good reason for making them as high as, or higher than the rates on the manufactured product. Incidentally he gives an interesting statement of the factors which made up the cost (on his road 1.23 cents per car per mile) of freight car service.

should be less than the cost of repairs of stock cars owned by the railroad companies per mile.

Much has been made of the mileage of 1 cent per mile paid for the use of refrigerator cars, which is regarded as excessive; and it is, apparently, assumed that live stock hauled in the railroad company's own cars bears no such burden. This is a mistake. When the railroad company transports freight in its own cars, instead of paying the fixed amount per mile for the use, renewal and repairs of the car, it pays the interest on the cost of the car, and it pays the expenses, whatever they may be, of renewals and repairs.

Now, I will state the account of the Chicago Great Western of these burdens in respect to all of its freight [see table at foot of page], it being impossible to distinguish between live stock and other freight, because its stock cars are used to some extent in other than live stock shipments.

Its freight car equipment has cost \$5,583,425.75 of actual cash. The interest on this amount for one year at 5 per cent. is \$279,161.25. As there are no cars in use in the United States to-day which were in use 25 years ago, it is fair to estimate the lifetime of a car at, say, 25 years, which would make the annual depreciation 4 per cent., which, on the above cost, is equal to \$223,337. The amount expended for labor and material only, in repairs of freight cars during the fiscal year, was \$307,211.90. In order to make these repairs, and the repairs on its locomotives, etc., the railroad company must have expensive shops and tools, and some proportion of the interest on the cost, and the depreciation and repairs of the shops and tools, is a burden properly chargeable to this account. The actual cash cost of the principal shops and tools has been \$603,043.88. Five per cent. interest on this amount, and 5 per cent. for depreciation and repairs upon the shops and tools, which is probably less than the actual cost, would be \$60,304.38. Say, 20 per cent. of this amount is chargeable to freight cars, \$12,060.86. In order to make these repairs, and the repairs on its locomotives, etc., the railroad company must carry a large stock of material, and some proportion of the interest on the stock thus carried is chargeable to the cost of repairing freight cars. The average stock of material carried for such repairs is \$486,386.18, and it is estimated that 60 per cent. of this stock is for freight car repairs, or, say, \$291,831.60. The interest at 5 per cent. is \$14,591.55.

In order to make repairs to freight cars every company must have side tracks at all its division points and many of the principal stations, specially devoted for standing freight cars for the purpose of being repaired, and used for no other purpose. The entire interest and cost of maintenance of these special side tracks constitute a burden chargeable to freight cars. Many of these side tracks, and indeed most of them, occupy land which has cost at the rate of \$5,000 per acre, and some of it as much as \$20,000 per acre. In addition to this land occupied by the side tracks there must be vacant, equally high priced land adjacent for piling repair material, and storage houses. The Chicago Great Western has plants at 10 such stations, and minor plants at other stations. I have not had time to get the exact mileage and quantity of land consumed by these special side tracks, but I think an estimate of 10 miles of track and 60 acres of land, in the aggregate, would not be too high an estimate. Reckoning the cost of the side tracks at only the cost of the rails and ties, \$5,000 per mile, and land at \$5,000 per acre, the actual cost would be \$350,000. The interest at 5 per cent. and say nothing of the cost of repairs, would amount to \$17,500. There are minor items, such as lighting and heating shops, fire insurance on both shops and cars which, in the aggregate, amount to large sums, but are distributed through the accounts in such a way that it is not easy to marshal them, and therefore in this calculation we make no account of them; and thus we find that the entire annual burden of these major items amounts to \$853,862.56.

The Chicago Great Western collected from other companies during the year for the use of its freight cars while on their line, in excess of the amount which it paid to other companies for the use of their freight cars on its line, the sum of \$163,141.14, which, being deducted, leaves the aggregate burden upon the freight business of the Chicago Great Western Railway Company, for the use of its own freight cars during the fiscal year ending June, 1905, at \$690,721.42.\*

The mileage of loaded and empty freight cars of all classes owned by the company and by other railroad companies, after deducting the miles run by private car lines, amounted to 56,705,351

\*Cost of Use, Renewal and Repairs of C. G. W. freight cars for one year:  
Interest on cost (\$5,583,425.75 @ 5%) \$279,161.25  
Depreciation, 4 per cent. per year..... 223,337.00  
Repairs (material and labor)..... 307,211.90  
Interest and depreciation, shops and tools..... 12,060.86  
Interest on stock of repair material..... 14,591.55  
Interest on cost of repairs, tracks and grounds..... 17,500.00  
Heating, lighting, fire insurance (not considered).....  
Total..... \$853,862.56  
Deduct credit balance of interchange car service..... 163,141.14

Net cost of car service on C. G. W..... \$690,721.42

car miles. Dividing this quantity into the total burden (\$690,721.42) makes the actual cost, per freight car mile, 1.23 cents for use, depreciation and repairs of its own cars, against the 1.1 cents paid to the packers for the use, depreciation and repairs of refrigerator cars. This extraordinary result is rendered more extraordinary by the fact that the average cost of the railroad car is \$563.86, while the average cost of a refrigerator car is \$1,200. The high per-mile cost for the use of the railroad cars is the result of the small mileage which such cars make under existing conditions, averaging about 22 miles per day of 24 hours.

There are other burdens upon the transportation of live stock which do not pertain to the transportation of packing house products. Live stock is loaded to be delivered at the market before the close of the market hours. If, for any reason—which can by any means be construed as the fault of the company—the stock is not delivered before the close of the market hours and the market declines the next day, a claim for damages is made against the railroad company. The damages paid on this account during the fiscal year 1905, by the Chicago Great Western amounted to \$24,366.45, equal to an average of \$1.61 per car.

The railroad, on this through live stock business, pays for loading the car at the stock yards on the Missouri river, which constitutes a burden on the live stock business, from 50 cents to \$1 per car, without any corresponding burden on the packing house business, as the refrigerator cars are loaded and unloaded without expense to the railroad company. The railroad is also compelled to clean live stock cars at an expense of from 50 cents to \$1 per car, without any corresponding burden upon the packing house product business, as refrigerator cars are cleaned by their owners.

During the hot weather the product has to be iced once in transit, but the expense is paid by the shipper. During the hot weather the live stock is sprayed with cold water several times in transit, the whole expense of which is paid by the carrier. It is difficult to state the exact cost, but 25 cents per car is probably a close approximation.

In addition, in the shipment of live stock, the shipper is entitled to free transportation for one passenger for each two carloads shipped, from the point of shipment to Chicago on the train which carries the stock, and free return ticket on first class passenger trains. Estimating the value at one-half regular rates, it would amount to \$6.50 per car.

The principal burdens per car upon the through shipments from market town to market town, which are not alike on live stock and their products, can now be marshaled on the basis of a 500 mile haul from the Missouri river to Chicago, as follows:

	Cattle.		Hogs.		Packing house products.		Fresh meats.	
Use of car .....	\$6.16	\$6.15	\$6.16	\$6.15	\$5.50	\$5.50	\$5.50	\$5.50
Damage on account of delay .....	1.61	1.61	1.61	1.61	.....	.....	.....	.....
Loading (average) .....	.75	.75	.75	.75	.....	.....	.....	.....
Cleaning cars (average) .....	.75	.75	.75	.75	.....	.....	.....	.....
Icing and spraying .....	.25	.25	.25	.25	.....	.....	.....	.....
Passenger service .....	6.50	6.50	6.50	6.50	.....	.....	.....	.....
Total.....	\$16.01	\$16.01	\$16.01	\$16.01	\$5.50	\$5.50	\$5.50	\$5.50
As most of both classes of cars must be returned empty, it is perhaps fair to add the return use of cars.	6.15	6.15	6.15	6.15	5.50	5.50	5.50	5.50
Total.....	\$22.16	\$22.16	\$22.16	\$22.16	\$11.00	\$11.00	\$11.00	\$11.00

It has already been stated that the average rate per cwt. on cattle is 18 cents; on hogs, 19½ cents; and on their products is 20 cents; and that the aggregate of the unequal burdens is \$22.16 per car on live stock, and \$11 per car on their products. I now testify that the average pay load on the Chicago Great Western of cattle is 21,513 lbs.; of hogs 16,636 lbs., and the average weight of the Chicago Great Western stock car is 27,500 lbs. The average pay load of packing house products is 31,632 lbs.; of fresh meats 22,414 lbs.; and the average weight of refrigerator cars in which they are hauled, including non-paying ice, is 41,000 lbs.

Based on these figures, the weight hauled and revenue per car received, and net rate per cwt. received for hauling the load and car, is found to be as follows:

	Cattle.		Hogs.		Pkg. house products.		Fresh meats	
	Wght.	Rev.	Wght.	Rev.	Wght.	Rev.	Wght.	Rev.
	lbs.	\$	lbs.	\$	lbs.	\$	lbs.	\$
Pay load .....	21,513	38.72	16,636	32.02	31,632	63.26	22,414	44.82
Car .....	27,500	.....	27,500	.....	41,000	.....	41,000	.....
Total.....	49,013	38.72	44,136	32.02	72,632	63.26	63,414	44.82
Deduct unequal burden*.....	22.16	.....	22.16	.....	11.00	.....	11.00	.....
Total weight hauled and net revenue per car received.....	49,013	16.56	44,136	9.86	72,632	52.26	63,414	33.82
Net rate per cwt. received upon all pounds hauled .....	3.39c	.....	2.24c	.....	7.19c	.....	5.3c	.....

\*As above.

The analysis shows that, based on the cost of carriage, the tariff rate on fresh meats should be higher than the tariff on packing house products, to be strictly and mathematically correct. But in making the contract which has controlled the tariff rates on packing house products and fresh meats for some years, and will control them for some years to come until the contract ex-

pires, in the haphazard by-guess way in which rates are usually made, a uniform rate of 20 cents was made on both products.

As the tariff rates per cwt. on live stock are less than the tariff rates per cwt. on the product, and as the analysis shows that the rates received for the one service which is alike in both—the simple hauling—of the live stock from market to market is materially less than the rates received for hauling the products, and as this is the only principle which this action was brought to establish and enforce, these facts should entitle the case to be dismissed.

The local rate—the rate charged on animals that are picked up at local stations and hauled to Chicago, from the Missouri river to Chicago, 500 miles, is alike on both cattle and hogs, 23½ cents per cwt. There are no similar local rates on the products of animals, because the products are not picked up from station to station.

The local rate on live stock—although higher per cwt. than the amount received on packing house products—is, as a matter of fact, when based on the cost of hauling, lower than the packing house rate. All of the special burdens which have been stated as applying to live stock shipments from markets to markets, apply to local shipments, except the loading of cars at stockyards at the Missouri river, which was given at 75 cents per car. Deducting this 75 cents from the total burden, leaves as the burdens which have been enumerated on live stock \$21.41 per car.\*

In addition, the railroad company is obliged to furnish stock pens at each station where stock is loaded, for no other purpose than the shipment of live stock. These stock pens represent, in the aggregate, a very large investment, and the interest on their cost, and the cost of repairs, is an additional burden peculiar to the local shipment of local live stock. It is not easy to fish out from the voluminous construction accounts the actual cost of these stock pens, but I happen to have data which gives a practical basis for such an estimate. In 1903 I built a line from Fort Dodge, Iowa, to Council Bluffs, a distance of 133 miles, on which 22 stock pens were built, and their actual cost was \$31,284.58, an average of \$1,422.04 each. This does not include the cost of paving the floors, which will have to be done later, at an average cost of, probably, \$1,000 each, an expenditure which the company has already made on many of its older pens. The Chicago Great Western has 240 stations where there are stock pens. At an average cost of \$1,422.04 each, without considering the cost of paving such floors as have already been paved, the aggregate investment would be \$341,289.60. Five per cent. interest on this amount, and 5 per cent. for renewals and repairs, would amount to \$34,128.96 per annum—or, upon the shipments during the year 1905 of 15,134 cars, would amount to \$2.25 per car. In addition, these stock pens have to be periodically cleaned by the railroad company; stock cars have to be sent, practically one at a time, to the pens to be loaded, which delays trains and adds materially to cost of transportation. It is impossible to state how much, but a low estimate would be 25 cents per car; making the total special burdens on local shipments of live stock \$23.91 per car.

Now, the former analysis shows that the 20-cent rate on the products of animals, after deducting the burdens, leaves a rate of 7.19 cents per cwt. for simply hauling the load, plus the weight of the car. Evidently, a rate on cattle, which, after deducting the burdens, would give the same rate of 7.19 cents per cwt. for simply hauling the load of cattle, plus the car, would be the mathematical equivalent of the 20 cent product rate. The average weight of a carload of cattle being 21,513 lbs., the weight of the car being 27,500 lbs., the two together would weigh 49,013 pounds.

7.19 cents per cwt. on 49,013 lbs. is.....	\$35.24
Add to this the special burdens .....	23.91
Makes a revenue per car of.....	\$59.15

which must be collected on the 21,513 lbs. of cattle constituting the load, equal to 27.5 cents per cwt., which is 4 cents more than the local rate on cattle. By the same mathematical process, the hog rate which would be equivalent to the 20 cent products rate would be 33.5 cents per cwt., which is 10 cents more than the local rate on hogs.

If the comparison is made with the lower rate, which the analysis shows the 20 cent product rate gives on shipments of fresh beef 5.3 cents instead of 7.19 cents, the mathematical equivalent of the lower rate is 23.19 cents on cattle and 28.43 cents on hogs.

The Interstate Commission, in the decision of this and other cases, seems to think that from some supernatural reason, which it is unable to understand or explain, in all cases the manufactured products of all material should bear a higher rate per cwt. than the raw material from which it is manufactured. As a matter of fact, the manufacturing of many materials produces a product

more bulky, which makes the carload less, in proportion to the weight of the car, than the car load of the raw material. When such is the result, based on the cost of carriage the manufactured article should bear a higher rate per cwt. than the raw material. Such is usually the case when, say, iron is manufactured into machinery. But when pig iron is manufactured into bar-iron or rails the bulk is not increased, and such a supposed rule should not obtain. So when live stock is changed into its products the bulk is not increased, but, in fact, is decreased, and consequently the product should bear a lower rate per cwt., based on the cost of carriage, than the live stock.

Relative rates between the raw material and the manufactured product, based on the cost of carriage, is a problem of facts and pure mathematics, and there is nothing occult or supernatural pertaining to the problem. It is unfortunate that the men who make the tariffs of rates are not mathematicians, instead of fairly good guessers. They guess that if one rate is so much, another rate, in order to be relative, should be about so much.

In my opinion, it is entirely possible to construct a tariff mathematically, on the basis of adding to the terminal expenses and special burdens of each class of shipments, practically constant quantities for the cost of hauling, which would be symmetrical and equitable and satisfactory both to the railroads and the people. And that schedules of such rates could be printed in a form which would be so easily understood that any man of ordinary ability, by inspection of the schedules, could tell for himself the legal rate upon any shipment which he might desire to make. The present Interstate Law requires such schedules to be made by the railroads, and if the railroads fail to make such schedules the law requires the Interstate Commission to prescribe the form and compel the railroads to adopt the form thus prescribed. But in this respect both the railroads and the commission have failed to comply with the law.

The rate of speed at which freight must be moved is an important element affecting the cost of transportation, but as the Chicago Great Western road's live stock and products are generally carried in the same train, and, generally speaking, practically the same rate of speed is required in the transportation of live stock and its products, it is not a factor in this analysis.

Mr. Stickney presented one other table, designed to show that the rates charged by his road do not discriminate in favor of the western live stock markets as against Chicago. In the year ending June 30 last the number of cars of live stock, both through and local, was 15,134, of which 9,842, or 65 per cent., went to Chicago. But considerable numbers were carried to St. Paul, Omaha and St. Joseph, and some of these from places more than 150 miles east of those points. To St. Paul the number of cars was 1,048, each carried an average distance of 66 miles; to Omaha 1,038, average distance 43 miles; to St. Joseph 2,884 cars, average distance 62 miles, and to Kansas City 322 cars, average distance 250 miles. Of through live stock to Chicago the C. G. W. carried 1,400 cars from South St. Paul, but aside from this the total through shipments from market to market aggregated only 137 cars.

#### History of the Walschaerts Valve Motion.\*

BY M. J. BOULVIN,

Professor at the University of Ghent.

Egide Walschaerts died on the 18th of February, 1901, at Saint-Gilles, near Brussels, at the age of 81 years. His mechanism, which is so original, has been adopted for many years in most of the countries of Europe and has been wrongly attributed to Mr. Heusinger von Waldegg. He was born January 21, 1820, at Malines, which place became, 15 years later, the central point of the System of Belgian Railways. The line from Brussels to Malines was opened in 1835, and this event decided the career of young Walschaerts. Three years later, at the exhibition of products of Malines, there appeared some remarkable models executed by him, and described as follows in the catalogue:

No. 19. M. E. Walschaerts, Jr., student of the Municipal College:

- A stationary steam engine of iron (the main piston having the diameter of 4.5 c.m. or 1.77 in.).
- A working model of a locomotive in copper to the scale of 1/20 of the railway locomotives.
- Section of a stationary steam engine.
- Model of a suction pump and of a duplex pump.
- Glass model of an inclined plane.

Minister Rogier was so much struck by it that he had Walschaerts enter the University of Liege, but his studies were interrupted by a serious illness, and were never completed. We find traces of him at the National Exhibition in Brussels in 1841. The report of the jury mentions with praise a small locomotive constructed entirely by Walschaerts, and a steamboat 6.50 meters long and 1.75 meters wide, which was capable of carrying 16

\*Burdens on local live stock traffic:

As in preceding statement (\$22.16 less .75).....	Per car.
Interest and depreciation, stock pens.....	\$21.41
Cleaning pens, etc. ....	2.25
Total .....	23.91

\*Translated from Revue de Mécanique by Lawford H. Fry.

men and traveling (so the report says) at 4 leagues an hour on the canal.

The boiler of this little boat was of a new system invented by the constructor. The jury does not give further details. Walschaerts received the silver medal.

In 1842 Walschaerts was taken into the shops of the State Railway at Malines as a mechanic. Machine tools existed only in the most rudimentary forms, and the store rooms were badly provisioned. The lack of organization in the shops rendered a man of Walschaerts' abilities particularly valuable, and at the end of two years he was made shop foreman at Brussels. Although he was only 24 years of age he had already shown the qualities which make an engineer, which should have carried him in a few years to be the technical head of the motive power de-

partment. It is humiliating to be compelled to say that he remained shop foreman throughout his life.

The first locomotives came from England and had not been in service for more than ten years when Walschaerts was made foreman. The railroad was growing rapidly and it was necessary to increase the forces and to acquire experience. Walschaerts was not content with the duties incurred in these difficult circumstances, but began his career by the invention of his system of valve motion.

On October 5th, 1844, Mr. Fischer, Engineer of the Belgian State Railways filed for Egide Walschaerts an application for a patent relating to a new system of steam distribution applicable to stationary steam engines and to locomotives. This Belgian patent was issued on November 30th, 1844, for a term of fifteen years. The rules of the department did not allow a foreman to exploit a Belgian patent for his own profit and this explains probably the intervention of Mr. Fischer, who has never claimed the slightest part, material or moral, of the invention.

On October 25th of the same year Walschaerts took out a patent in France for the same invention. There also exists among the documents left by the inventor, a contract signed at Brussels in 1845 by Demuldre, from which it appears that he undertook to obtain a patent of importation into Prussia for the new valve motion, subject to an assignment by Walschaerts of half of the profits to be deducted from the introduction of the new valve motion in this country. It is probable, however, that this contract was never

extensively used, namely that of Sharp, with two eccentrics with forked rods. The link attributed to Stephenson was invented by Howe in 1843, and it is doubtful whether Walschaerts had ever seen it. A problem which nowadays appears very simple was for the investigators of that time extremely complicated, and the man who discovered the most correct solution which has yet been put forward merits unreserved admiration.

Notwithstanding his work at the Brussels shops, where he built, with limited equipment, several new locomotives, Walschaerts did not lose sight of the problem of steam navigation, and appeared at the National Exposition at Brussels in 1847 with a screw yacht which ran successfully. The propeller had several blades, each one with only a small part of the thread similar to those of the modern screws. Walschaerts had invented this arrangement himself, without knowing of the results obtained by

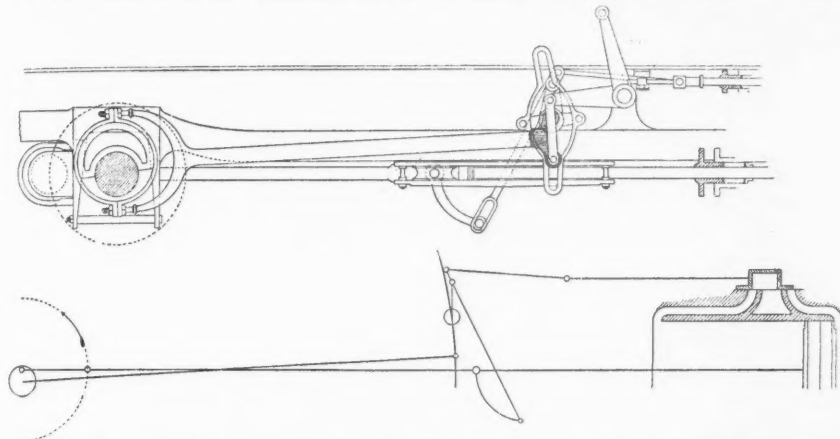


Fig. 1—Walschaerts Valve Motion—Belgian Patent, October 5, 1844.

carried out.

The design attached to the Belgian patent is reproduced in Figure 1 herewith. In this primitive arrangement the link oscillated on a fixed shaft, in regard to which it was symmetrical, but it had an enlarged opening at the center so that only at the ends was it operated without play by the link block, which was made in the form of a simple pin. There was only one eccentric, the rod of which terminated in a short T carrying two pins. The reverse shaft operated the eccentric rod and maintained it at the desired height. For one direction the lower pin of the T engaged in the lower end of the link, and to reverse the engine the rod was raised so that the upper pin engaged in the upper end of the link. The angle of oscillation of the link varied with the position of the pin in the link, and this oscillation was transmitted by an arm to the combining lever, which was also operated by the crosshead.

The central part of the link could not be used for the steam distribution, as it was necessary to enlarge it to allow for the play of the pin which was not in operation. It may be asked why

Normand with the Corse in 1841 or 1842. Locomotive practice had taught him the intimate correlation which should exist between the engine and the boiler and in this machine he made use of a boiler of high power which attracted much attention. A similar machine was built a little later by the Couillet Co., as is shown by the plan drawn up in 1853. This machine is compact and light. The documents which remain do not mention the pressure or the speed. It was non-condensing, and in all probability the exhaust steam assisted the draft.

During the years which followed Walschaerts' activity was given entirely to his duties as foreman and it is difficult to determine his part, which was valuable though anonymous, in the design of the railroad equipment. He is credited with the differential throttle in which the opening of an auxiliary slide on the back of the main slide assisted the opening of the valve. He also designed a brake with shoes acting on the rails which was used for a long time in switching locomotives and in which the principle of a lever acting near its dead point was applied in an ingenious manner.

It was very remarkable that his initiative spirit did not suf-

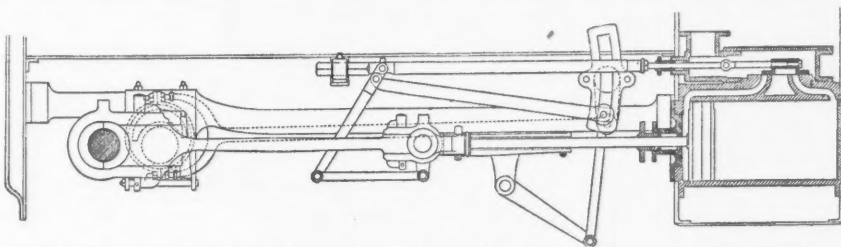


Fig. 2—Walschaerts Variable Expansion Valve Motion Applied to Locomotive No. 98, Brussels, Sept. 2, 1848.

fer from his long services under an administration with so much complicated routine. It is possible that he found a stimulant in the adoption of a large number of his ideas by the Great Central Belgian Railway and in encouragements which, without making him rich, kept his intelligence on the alert. He took an important part for many years in the design of the motive power of this railroad, which was rendered the more difficult by reason of the difficult profile of the lines terminating in Charleroi and by the heavy traffic to be handled. The design of the freight locomotives for heavy grades, built in 1862 for the Great Central, belongs entirely to Walschaerts. The Company built more than one hundred locomotives from the original plans without making any important alterations. These locomotives have not been without their influence on the Belgian shops in which they were built. They have left behind them traditions of which traces are found in a large number of engines exported to various countries of Europe.

#### The York Process for Rolling Steel Ties from Old Rails.

The York steel tie shown in the accompanying illustrations is single-piece, rolled in a special mill from old and worn-out rails of any weight. It is cheap, elastic and should have a long life, judging from the experience with steel ties in other parts of the world. In Europe nearly four million Post-steel ties are in use, some of them having been in track nearly 30 years. The Post tie, which is in the shape of an inverted trough, and is pressed



Fig. 1—Sections Rolled from Old Rail.

from a steel plate, has been tried in this country on the New York Central, but without success on account of poor design and insufficient strength under the rail seats, which caused the ties to crush down under the heavy shocks. More recent ties in this country have been designed as a constrained beam and, theoretically, uniformly loaded upward on the bottom surface by the pressure of the ballast with two points of support under the rails. This has resulted in a modified I-beam section having a large section moment and vertical stiffness with minimum cross-sectional area and weight. A number of such sections have been designed and some experimental orders have been placed for them. The I-beam section, however, as at present made requires either an expensive process of rolling for a one-piece tie on account of the wide thin lower flange necessary, or the equally objectionable punching and riveting for a built-up tie using a light I-beam with symmetrical flanges or an old rail for the top member and a thin



Fig. 2—Steel Tie Section Rolled from Rail Shown on Left.

broad flat plate on the bottom to give the necessary bearing surface in the ballast. The original Buhrer ties put in on the Lake Shore & Michigan Southern were built up in this manner from sections of worn out 65-lb. rail. These have given satisfaction in the track as ties, but they cost too much and are so rigid that rails break in cold weather. The inventor's original idea was to re-roll old rails to the required section with a wide bottom flange, but no rolling mill process was then perfected whereby the mass of metal in the head of the old rail could be made to assume the shape wanted. The Carnegie rolled tie, which has recently been put in the track of several railroads in experimental quantities, has a base 8 in. wide, but the process of longitudinal rolling on the side requires a billet of even greater dimensions in the square for the reduction to the finished shape. This, of course, makes

the process of rolling an expensive one and one which can only be carried out at a large modern steel works.

The York process of rolling is a radical departure from any previous rolling mill practice, and enables almost any desired section to be made from either the head or bottom flange, no matter how badly worn or unsymmetrical the scrap stock may be. Fig. 1 shows a few of the many structural shapes which can be rolled from the rail shown on the left. Figs. 2 and 3 show the forms of ties which may be rolled, one with a flat bottom and the other with a concave bottom, giving the tie itself elasticity in the ballast under heavy loads. Any desired variation in shape or dimensions of these sections can be made to suit the ideas of designers. The preferred section is that with the wide flat bottom, 9 in. across the bottom flange which with 65-lb. rail is rolled

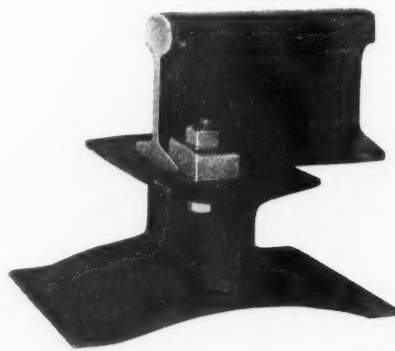


Fig. 3—Steel Tie with Elastic Concave Bottom.

to  $\frac{1}{4}$  in. thick at the edges,  $4\frac{1}{2}$  in. across the top and 4 in. high. The bottom flange is formed by rolling out the head and the top flange for the rail seat is formed from the bottom of the rail. No work whatever is done on the web and the height of the section is reduced only by the amount of reduction in thickness in the rail head. The bottom flange can be rolled out to any width or thickness, down to  $\frac{1}{4}$  in. at the edges. The section thus obtained has the requisite bearing surface in the ballast, ample strength against vertical crushing under the rail loads, maximum moment of resistance to vertical bending under the action of the tie as a constrained beam and minimum weight. An 8-ft. tie of worn 65-lb. rail weighs 160 lbs. The concave bottom section designed to give the tie vertical elasticity without vertical bending can be modified by rolling the top flange concave and the

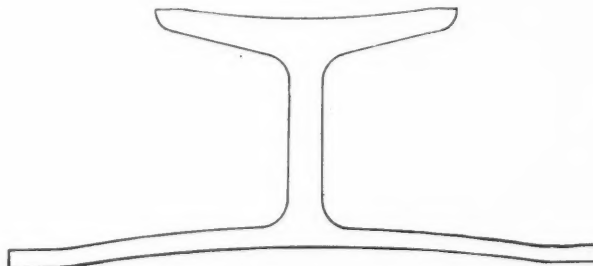


Fig. 4—Tie Section with Top and Bottom Flanges Curved.

bottom flange flat. Or, both flanges can be rolled concave as shown in Fig. 4. Fig. 5 shows a symmetrical tie section rolled from a rail, the head of which has been worn one-third away on one side.

The mill in which these sections are rolled is a lateral rolling mill with a single top roll and reciprocating platen or bed which moves under the roll at exactly the same speed as the periphery of the roll. For rolling 8-ft. or 8-ft. 6-in. ties the mill is made 10 ft. between housings. A number of lengths of rail are placed in loose forming blocks on the platen and these are automatically locked tight against the rail webs before beginning rolling. The only part of the rail which is subjected to any physical work is the flange projecting above the forming blocks which is rolled out sideways uniformly throughout the length of the section. This method of rolling permits the production of innumerable sections from almost any form of scrap stock. The top surface of the forming blocks can be given any desired shape to produce a flat or tapered bottom surface, corrugations, round or square corners, straight or rough edges to the flange, recesses at any point on the flange; in fact, every conceivable form. Similarly the top surface can be formed or indented in any way by suitable projections or depressions cut in the roll. The sections shown in Fig. 1 give some idea of the possibilities of the mill in rolling and form-

ing shapes which cannot by any manipulation be made in a longitudinal mill where, on account of the difference in periphery speed of different portions of the rolls, certain narrow limits are imposed on the relative thicknesses of the webs and flanges and on the amount of draft to enable the piece to clear the rolls.

Aside from the advantages of universal rolling, this method has the important feature of greatly improving the quality of

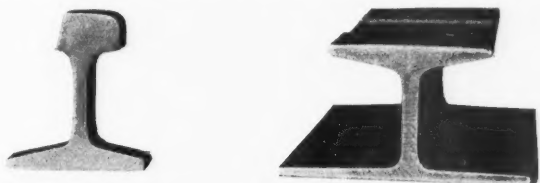


Fig. 5—Steel Tie Rolled from Worn Rail, Showing Grooved Rail Seat on Top Flange.

the metal. In rolling steel rails the web and bottom flange receive the most physical work in the mill and are finished much colder than the comparatively large mass of metal in the head. The head, therefore, is the weakest part of the rail. When an old rail is rolled in the York mill, the head is given the greatest amount of physical work and the finishing passes can be made at a black heat. The quality of the metal is thus greatly improved both by the amount of and temperature at which the rolling is done.

By manipulation of the roll the metal can be made to flow in either direction as the platen passes under it. A worn rail head can thus be rolled out into a thin flange with the metal symmetrically distributed on both sides of the web. The surface under the roll can be curved slightly by a reduction on the last pass or finished straight and level by making one or two light passes at the end without reducing the thickness. If a decided curvature



Fig. 6—Reduction of Metal in Head of Rail to Form Bottom Flange.

is required the proper form must be given to the forming blocks. No new problems in roll-turning are involved, as the rolls can be made the desired shape and chilled without difficulty as can the wearing surfaces of the forming blocks. One mill has a capacity of 500 tons of finished material a day.

A number of interesting features have been combined in the York steel tie which have not been touched upon previously. The section shown in Fig. 3 has a shallow groove rolled in the top surface under the rail in which the rail rests and is prevented from moving sideways on the tie. This feature prevents all shear of the fastenings and at the same time takes away only a trifling part of the resistance to vertical shear under the rail. To prevent the tie from moving laterally in the ballast on curves, ribs or projections can be formed across the bottom surface as frequently as is necessary simply by grooving the roll; or the ends

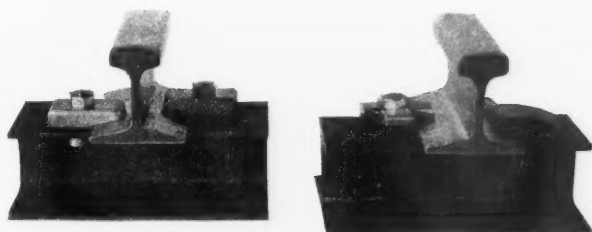


Fig. 7—Three Types of Rail Fastenings.

can be turned down by a modification of the forming blocks on the bed.

The shape of the tie permits a great number of different types of fastenings to be used and several which have been designed are shown in the illustrations. Fig. 7 shows three types. The first is the usual clip and bolt type, two clips being used on each tie bolted through the top flange on opposite sides of the web. The

second is a modification of the first, having four clips formed in the shape of a cross, each clip being of different length to accommodate different weights of rail having narrow and wide bases. The third is the simplest and best of the three. Two holes are punched through the top flange, one on each side of the web, and a rectangular hole through the web just under the flange. The clip is in the shape of a T with the vertical leg split to pass down over the web. When the clip is dropped in a wedge key is driven through the hole in the web and the slots in the legs of the clip. This draws the head of the clip down firmly against the base of the rail and by bending over the wedge key slightly after it is driven home the fastening cannot work loose. If wear takes place the key can be driven in a little farther and again bent over. To remove the clip the key is straightened with a blow of a hammer and knocked out.

A stiff bridge joint has also been designed, the parts of which can be made entirely from rail scrap. Fig. 8 shows the joint as applied with steel ties. A short section of rail is rolled with the head tapered at the ends. The head and base and part of the flange are cut away to form two tenons on the web, which fit in holes punched in the webs of the joint ties. The joint is assembled and the fish plates bolted up, after which wedge keys

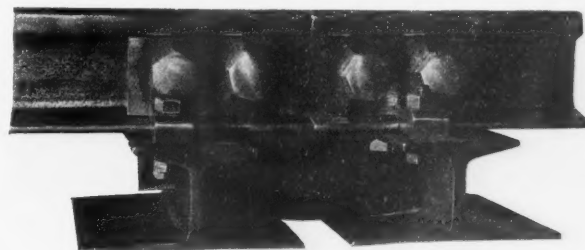


Fig. 8—York Bridge Rail Joint.

are driven through slots cut in the projecting tenons of the bridge rail. This draws the joint ties together and the taper on the head of the rail corresponding to the taper on the bottom flanges of the ties forces the bridge rail up tight against the base of the track rails. As wear takes place the wedge keys are driven farther in and the bridge rail is forced up against the track rail. The illustration also shows another method of preventing the rail from moving sideways on the tie. Grooves are rolled in the top surface outside of the rail seat and the tie clips are formed with a lip on the outer end which fits down in the grooves.

The process of rolling these ties and the sections, fastenings, joints, etc., have been designed and perfected by Mr. James E. York, Mem. I. and S. Inst., Mem. Am. Inst. Min. Eng., President of the York Rolling Process Co., Whitehall Building, New York, which owns the patents on the method. We are indebted to him for the illustrations and other data from which this article was prepared.

#### Progress at Panama.

Secretary Taft delivered an address before the Commercial Club of St. Louis, Nov. 18, in which he gave a clear statement of the present situation at Panama. An abstract of this address is printed below.

The publication of the interview with Mr. Wallace was made after consultation with the President, and was made not for the purpose of punishing Mr. Wallace, but because the public were entitled to know the facts and because it was hoped it would discourage others engaged in responsible positions in the construction of the canal from withdrawing at critical stages of the work without sufficient notice. This is all there is of the Wallace incident, except that I have been very glad to assure the advisory board, or the board of consulting engineers, that I believed Mr. Wallace to be an able, experienced engineer and an honest man who had large opportunities for acquiring information which would be valuable to them. I advised them to call him. Mr. Wallace has fully and freely responded to the call and has answered all questions, and has declined any compensation whatever.

I come now to discuss the actual progress which has been made. By the first of December we shall have spent \$60,000,000 in the course of acquiring a canal. The two questions which the American people have a right to ask are, first, have we proceeded without unnecessary delay? Second, have we received our money's worth?

Many thoughtless persons cry out, "Why does not the dirt begin to fly? The way to build the canal is to dig." Such remarks only show ignorance and complete failure to understand the real character of what has to be done. The canal is to be built by manual

labor and machinery. The number of laborers required will perhaps be 25,000.

Panama is sparsely settled, with few laborers available. The great majority must be imported. For every laborer at least one person more will come who will be dependent on him. We must, therefore, count on an alien population of 50,000 along the line of the canal for 47 miles. To get the best work they and their families must be housed; must have healthful food; must have pure water to drink, and the filth caused by such a collection of beings must be taken care of so as not to promote disease. Yellow fever and malaria must be stamped out. All these things ought to be done before the "dirt begins to fly."

Panama is one of the oldest towns in America, and yet during the dry season there has been no means of furnishing water except from cisterns, puddles and receptacles often covered with green scum and as productive of disease as is possible to imagine. The first thing the first commission did was to arrange for a water supply for Panama. Engineer Wallace took a reservoir partly constructed by the French, built the dam 20 ft. higher and laid the mains into Panama, so that on July 4, 1905, the people were permitted to drink pure water. This reservoir furnishes water also to the town on the Pacific side; but another reservoir for Culebra, another one for Empire, another one for Bas Obispo, and others for Colon are being constructed. Sewers are now being constructed in Panama. To make Panama healthful the commission has decided to pave the streets, which for centuries have been dirty—muddy in rainy weather, dusty in dry weather, and full of disease in all weathers. The whole strip from Panama to Colon was grown up with underbrush, weeds and jungle. Now the jungle is being cut down, the hills are being shaved, pools are being drained, swamps relieved of water, and in every way the stagnant water surfaces and the propagating ground for the deadly mosquito are being reduced. The mosquito is the worst enemy in the propagation of disease in the West Indies and American tropics that man has.

As Mr. Stevens said to me, when I crossed the Isthmus with him this month, "I take off my hat to the work which the sanitation department has done in this Canal Zone." In the month of August among a force of 13,000 men the percentage of illness was less than 25 per thousand. Good food is now furnished by a commissary at reasonable rates. The carrying of refrigerated fruits and meats from Colon across the Isthmus has been begun. There is an ice plant at La Boca, another one at Colon, and others along the way are to be built, so that ice—that most healthful form of liquid in the tropics—will be at hand for all.

A hotel has been erected at Corozal, where the American employees of the commission may live and run in to their business in Panama in a few minutes by railroad. A hotel of 128 rooms is being constructed at Ancon. The French had excellent hospitals at Ancon and Colon, but it was necessary to refit them entirely. And now we have a hospital at Ancon, one at Panama, a convalescent hospital at Taboga, an island some 10 miles off the coast in Panama Bay, where very healthful water, healthful bathing and fine fruits can be had, so that in all, the hospital accommodation has been increased from about 350 to upward of 1,000 beds.

One of the great burdens is the procurement of transportation and proper disposition of the immense amount of supplies and equipment which have to be ordered and pressed forward to the Isthmus. The commission bought two large freight steamers costing \$650,000 apiece. And even with these and three others owned by the Panama Railroad there is still much difficulty in getting the requisitions of the chief engineer supplied. The following is a list of the principal items of material purchased and delivered, or now under order, and will serve to give an idea of the vastness of the undertaking and why congestion in sea transportation and on the railroad, with all the commercial traffic besides, may be pardonable:

61 steam shovels.	152 rock drills.
1,300 flat cars.	30,000,000 ft. lumber.
12 rapid unloaders.	2 dipper dredges.
22 unloading plows.	646,000 lbs. blasting powder.
13 earth spreaders.	617,500 lbs. dynamite.
324 dump cars.	7,000,000 paving brick.
12 hoisting engines.	3,500,000 building brick.
120 locomotives.	500,000 sq. ft. roofing tile.
5,000 tons of steel rails.	36,000 bbls. cement.
125,000 cross-ties.	3 steel water tanks and towers.
12,000 pieces of piling.	12 standpipes.
14 air compressing machines.	2 ocean steamships.
3 cranes.	

The Panama Railroad on its own account has also purchased during the last six months:

500 box cars, 40 tons.	1 locomotive crane.
12 caboose cars.	1 pile driver.
10 refrigerator cars.	3 track scales, 100 tons.
6 passenger coaches.	1 coal hoisting plant.
24 locomotives.	1 cantilever crane.
2 wrecking cranes.	

Mr. W. Berdrow, commenting in the *Journal* of the German Railroad Union, on the "Oregon Pony" exhibited at St. Louis, notices that for a long time American builders of express locomotives depended chiefly on increased piston-speed for fast-running, and used

wheels of comparatively small diameter. "Then, however, especially through the investigations of Professor Goss, at Purdue University, American engineers came to the conviction that for high-speed locomotives the increase of driving-wheel diameter is more economical than increased piston-speed."

#### October Decisions in Railroad Law.

The following abstracts cover the important railroad law cases decided by Federal courts in October:

*Patent for engineer's brake valve invalid.*—The Circuit Court for the northern district of New York has decided that the Westinghouse and Moore patent for an improved engineer's brake valve, granted April 23, 1899, is void on the ground that the claim in the application for the patent was too broad. The court further held that this defect was not remedied by a subsequent disclaimer or abandonment of the claim except as to a single form of construction of the appliance, the court not being able to determine whether this form of construction was really included in the broad language of the original claim. The court took the ground that the Federal statute allowing a disclaimer where the claim is too broad is applicable only where the portion of the claim retained is clearly embraced in the original claim. *Westinghouse Air-Brake Co. vs. New York Air-Brake Co.*, 139 Fed. Rep. 265.

*Federal jurisdiction over non-residents.*—The Circuit Court for the District of Nevada has passed upon a new phase of the Act of Congress providing that when jurisdiction is founded on diverse citizenship, suit shall be brought only in the district of the residence of one of the parties to the suit. In the case in question the Southern Pacific Company, incorporated under the laws of Kentucky, and hence a resident of that state, was sued in Nevada by a resident of Utah. The question before the court was whether the court had jurisdiction where both parties were non-residents of the district where suit was brought. The court held that the statute conferred a mere privilege on the defendant which he could waive, and having waived it the jurisdiction of the court was complete. The question has not been passed upon by the Supreme Court of the United States and is far from settled as the decisions of the various Federal Courts that have passed upon the question are far from harmonious. *Burch vs. Southern Pacific Co.*, 139 Fed. Rep. 350.

#### Work of the English Railway and Canal Commission.

The following account of the work of the Railway and Canal Commission of 1888 is taken in abstract from a paper printed by S. J. McLean in the *Quarterly Journal of Economics* for November, 1905. It is especially timely because it reviews the actual results obtained during the last 17 years by a body possessing many of the functions with which President Roosevelt wishes to endow the Interstate Commerce Commission.

The report of the Select Committee in 1881 had stated that a permanent railway tribunal was necessary, and legislation looking to the establishment of a new railway commission was introduced regularly between 1882 and 1886. In 1885 the nine principal railways submitted bills to Parliament embodying a general classification and a rearrangement of their maximum rates, but the protests of the traders led to the withdrawal of these measures. The legislation of 1888 introduced important changes as compared with the former Commission of 1873 in the court organization of the Commission, and in the limitation of the right of appeal. Under the old organization the Commission was considered to be in the same position as any inferior court, and might be prohibited from proceeding in matters over which it had no jurisdiction, but in 1888 the new Commission was given a definite court organization, and its decisions were made final on questions of fact.

The 1888 law provided for a Commission of five members, composed of two laymen and three *ex officio* commissioners. The *ex officio* members are Superior Court judges, one for England, one for Scotland and one for Ireland. The active Commission at any given time has a membership of three, the two lay commissioners, as they are termed, being presided over by the designated Supreme Court judge of the country in which the Commission is sitting. The judges who serve on the Commission are appointed for terms of five years, but the lay commissioners hold office on a good-conduct tenure. The old provision whereby one of these lay commissioners was required to be experienced in railway business was continued, and Mr. Price, the railway member of the former Commission, was reappointed. The qualification of the other lay commissioner was not specified, and to this position Sir Frederick Peel, whose training was legal and who had been a member of the Railway Commission in 1873, was appointed. (Sir Frederick is still an active member of the Commission, in spite of his advanced years.) The lay commissioners were admonished as to the judicial character of their functions, for in their letters of appointment they were informed, "Doubtless you will feel that the judicial nature of your

office is also incompatible with any active connection in political controversies."

While the jurisdiction given by the Act of 1888 embraces a variety of functions, the most important of which are discrimination, facilities for traffic, traffic on steamboats, through rates, rate books, terminals, legality of rates, provisions relating to private branch sidings, and references under the Board of Trade Arbitrations Act of 1874, the most important matters from the standpoint of the traders are, respectively, terminals, reasonable facilities, through rates, discrimination and control over actual rates. By way of confining this discussion to the limits of a single paper, only those portions of Mr. McLean's article are included which deal with the functions of the Commission bearing on the problems that now confront railroads and shippers in the United States. Therefore, the enumerated function first in importance from the British standpoint, that of terminals, may be entirely omitted, as the British conditions are peculiar to that country.

The through rate clause of the Act of 1888 provides that through rates, stating the amount, route and apportionment of the rate, may be proposed by a railway, a canal company or a trader, and in case of dispute regarding a rate or its apportionment the matter is brought before the Commission and the commissioners must consider the special circumstances of the case, and must not compel any company to accept lower mileage rates than it may, for the time, legally be charging for like traffic carried on by a like mode of transit on any other line of connection between the same points, being the points of departure and arrival of the through route.

With regard to "reasonable facilities" in general, the English law has held, broadly, that they must be such as can reasonably be required of the railway company, due allowance having been made for the way in which the service is already performed. Similarly, in a reduced through rate it must always be considered whether there is commensurate advantage to the railway. *Prima facie*, it has been held against public interest to interfere with vested legal rights unless some compensation or equivalent is given. There must, therefore, be evidence both of public interest and of reasonableness in favor of the rate and route sufficient to outweigh the former considerations. It has been held that the fact that two competitive routes will tend to make either company treat the traders more reasonably is a consideration bearing on the question of public interest, but at the same time the Commission will not grant a through rate which creates unhealthy competition. The reasonableness of a rate over a proposed route is not to be measured by an existing rate over an alternate route, even if the rate over the latter route may in itself be reasonable.

The Commission has more than once had to consider questions similar in their bearing to the points brought up in our testimony before the Senate Committee on Interstate Commerce on private and terminal railroads as to what constituted a railroad entitled to participate in a through rate. Thus it was decided in 1897 that the powers the Manchester Ship Canal possessed to build railways on its quays, although these railways were simply for its own uses, constituted it a railway company, but in 1901 the action of the Commission in approving a through rate arrangement for a dock company was overruled on the ground that the railways possessed by the dock company did not constitute a railway within the meaning of the Act. In 1903 a further application of the same company (The London & East India Docks Company) subsequent to its acquisition of a short railway with which it had made connections, was refused on the ground that the difficulties of exchange of traffic did not justify granting such an application.

The Commission has looked at each through rate case by itself, British "through rates" being in general analogous to our interstate rates, as distinguished from local rates. It has refrained from proposing a through rate, and has limited its action to accepting or rejecting a proposed through rate as brought before it. The power which traders have to propose through rates to the Commission has been of little value to them. They have not generally been possessed of the technical knowledge necessary to formulate a rate that the Commission would sustain, and they have been successful in only one out of five applications. Since the constitution of the present Commission, in 1888, it has acted only on 19 through rate applications, some of which have been made by canal companies, some by dock companies, some by traders, and one by a municipal corporation.

Discrimination, or undue preference, as it is termed in English law, has long engaged the attention of the Commission. Complaints were made in 1882 before the former Commission that many anomalies existed in domestic rates, and domestic shippers have always claimed that they were almost habitually placed at disadvantage with the shippers of foreign products. Of course, the obvious reason for this is that rail rates in England are tremendously modified, so far as foreign produce is concerned, by seaport competition, and if the lines which run from Liverpool to London, for example, do not offer an extremely low rate on over-sea traffic, it will be carried to London direct by water. This fact was recognized by the Act of 1888, although the traders seemed never to have fully recognized it, and the undue preference section of the Act provides that where,

for the same or similar service, lower rates are charged to one shipper than are charged to another, or any difference in treatment is made, the burden of proof that such actions do not constitute an undue preference shall be on the railway, while the commissioners must decide whether the difference in tariff or in treatment is necessary for the purpose of securing in the interests of the public the traffic for which it is made; but it is distinctly provided that no railway company shall make, nor shall the commissioners sanction any difference in the tariff for, or in the treatment of, home and foreign merchandise in respect of the same or of similar services. Before 1888 inequalities of charges for like services were only *prima facie* evidence, and the burden of proof was on the complainant; now it rests on the railway. A decreased rate to develop a particular traffic in a particular district constituted undue preference, but the mere fact that preference existed was not sufficient; it must be shown to be undue and unreasonable, and differences in rate might be allowed where there were differences in the cost of conveyance.

The present Commission has brought out some additional points in the matter of discrimination. A contract to give exclusive use of a given station to a particular colliery is undue preference; but competition has been held to be a circumstance to be taken into consideration, and the extent of it is considered a question of fact, not of law. As might be expected under these circumstances decisions on the preference cases have often been confused and contradictory. The long and short haul question comes before the Commission but seldom. The Commission has recognized effective competition as a justification of a lower rate for the longer distance.

From an early date English railway law has held that wholesale rates for large shipments did not constitute undue preference. So early as 1858 it was decided that carrying at a lower rate in consideration of large quantities and full train loads at regular periods was justifiable, provided the real object was to obtain a greater profit by reduced cost of carriage, although in taking this point of view it was recognized that certain shippers would necessarily be excluded from the advantage of the low rate granted on such conditions.

In dealing with the rate policy of the Commission a distinction has been made between the period prior to 1894 and the more recent years. Though it had been held in 1872 that legal maximum rates afforded but little real protection to the public, the system was continued by the Act of 1888. At the outset of its work the only way with which the Commission was brought in touch with rates was with the provisions concerned with undue preference and with through rates. The Commission will not state beforehand that a rate is preferential. There has been some difficulty in construing the statement in the original "undue preference" clause of the Act directing the commissioners to consider "whether the inequality cannot be mitigated without unduly reducing the rate charged to the complainant." Sir Frederick Peel, of the Commission, holds that that body may fix a through rate no matter what the railways concerned may have agreed upon. While this matter has not been passed upon judicially, the weight of opinion is against this interpretation. It would also appear that the Commission has no power to test the reasonableness of an established through rate, for although the Commission has power to fix a through rate if the parties do not agree, it would appear—although this is a moot point—that is, has no power to apportion such a rate. The Commission said explicitly in 1895 that it had no power under the Act of 1888 to inquire into the reasonableness of a particular rate. The reductions which have been ordered in connection with the workmen's trains applications are given in an entirely different jurisdiction.

The question of the reasonableness of particular rates was suddenly brought before the Commission in 1894. The adjustments necessary in putting into force the rates under the revised maxima were great. The fact that fully one-half of the traffic is carried on exceptional rates, which are below the class rates, still further complicated matters. At the same time there was an apparent desire on the part of some of the railways to give the traders an object lesson in regard to the disadvantages of the legislative intervention which had brought some maxima below the actual rates formerly charged. And so the maximum class rates were published as the actual rates effective January 1, 1893. The outcry which followed quickened the work of adjustment, and led to an undertaking on the part of the railways that the rate increase should not be more than 5 per cent. But this did not prevent the enactment of a piece of panic legislation, passed hurriedly and without due consideration. By this act it was provided that, where rates were directly or indirectly increased after December 31, 1892, they were *prima facie* unreasonable. The fact that the rate complained of was within the maximum was not to be a justification of the increase. The Commission was given power to deal with complaints arising under this act, subject to the provision that an application was first to be made to the Board of Trade. Over 1,700 complaints were brought before the Board of Trade between the date of the passage of the Act and the end of February, 1895. In taking up the new functions imposed by the revolutionary Act of 1894, the Commission had

a full appreciation of the difficulties of the new jurisdiction, and it held that it was not competent of its own knowledge to say whether a rate was reasonable or not. The cost of service was considered as a criterion of reasonableness, and this squared with the views of the traders, but has, as may well be understood, led to some peculiar decisions. No general principle has been established in the unreasonable rate cases, but the Commission has shown its intention to look at each case by itself. Thus, if a 5 per cent. increase should be found justifiable in a particular case, it would not necessarily have any bearing on a later decision. The desire of the Commission not to engage in any rate making experiments, has kept it from making any statements as to general rates, and it has concerned itself with the reasonableness of particular rates. The Commission has painstakingly endeavored to get at the cost involved, and then has given decisions which were compromises.

Looking at the make-up of the Commission, with its two lay members and its one judicial member, it is apparent that the presence of a railway representative among the lay members has meant that those appearing before it have been more careful to give essential details. There is no real cause for complaint from the traders' standpoint with regard to the service which the lay members have performed. The railway representative, for example, in enforcing the legislation of 1894, has followed very closely the ideas favored by the traders. In spite of the assumption of 1887 that giving a *locus standi* to governing bodies and to traders' associations would cause much litigation, the number of complaints before the Commission is not great. From 1889 to 1903, there have been on the average 50 applications a year, many of these of minor importance.

In view of the expense attaching to suits before the Commission it has been urged that the power possessed by the Board of Trade under the Act of 1873 to institute proceedings before the Commission should be utilized. But the government has held that to make a government department public prosecutor in cases before the Commission would savor rather of persecution than of prosecution.\*

The English Commission has used two sets of rate principles—competition as an important factor in differential rates, export rates, and in general in the home side of undue preference; cost of service in regard to preferential rates, and unreasonable rates. This has been in great degree attributable to the legislation. The traders have desired free trade in exports, not in imports. Admitting that there has been a certain judicial bias in favor of the cost of service principle, it is at the same time apparent that legislation, like that of 1894, which makes a past rate the *prima facie* criterion of reasonableness rules out the possibility of considering present competition. The defects of the legislation of 1894 are its own. The Commission has made the legislation less unworkable than could have been expected.

#### Irrigated Lands Along the Platte River.

A recent government report gives some striking figures to show what has been accomplished by irrigation in the valley of the Platte river. The first ditch diverting the water of this stream for irrigation was built in 1859. The Platte river and its tributaries now irrigate 1,924,463 acres of land. Some of the best farming land sells for \$300 and none that is irrigated sells for less than \$10 an acre. Fifty years ago this land was regarded as a desert and was practically worthless. If the right to use water in irrigation were taken away from it, it would be practically valueless to-day.

More than 500,000 people live in the irrigated territory on this stream. Not all of them depend on agriculture. The city of Denver with 200,000 people, Cheyenne with 15,000 people, Laramie with 7,000 people, North Platte with 10,000 people, and a score of other towns having from one to ten thousand inhabitants, with their machine shops, flour mills, paper mills, beet-sugar factories, and transportation interests, all tend to augment the importance of water, because not a city or town, a factory or a railroad, can be assured of the privilege of using the water of this stream without securing a right thereto through a definite legal procedure. The value of water rights for irrigation has risen from \$4 an acre to \$35 an acre, and stored water sells for even higher prices. Water to irrigate an acre of land has been sold for \$15 a year.

The average flow of water in the South Platte and its tributaries is 2,765 cu. ft. per second. Against this supply, rights to 30,597 cu. ft. per second have been established in Colorado and Nebraska. The area irrigated from the North Platte and its tributaries is about 900,000 acres. In Nebraska riparian rights are recognized, as well as rights of appropriation. Being inherent in the land, the first-named do not require any legal procedure for their establishment. The measurements of the water used and the water returned to this stream bring out the fact that a large percentage of the water diverted by a particular canal is not wholly lost, but

\*It is interesting to note that this suggestion is very closely in line with the suggestion frequently brought out in our own discussions on government regulation, that the Interstate Commerce Commission should become prosecutor before a special court, having the additional advantage that its opinion would be final on questions of fact.—EDITOR.

returns to the stream and is used over and over again. Some of the measurements showed that in low water the return seepage tends to increase the flow of streams rather than diminish it.

#### Railroad Shop Tools.

##### MILLING MACHINES. (Continued.)

As a plain milling machine for heavy service the Garvin No. 14 plain miller made by the Garvin Machine Co., New York, shown in Fig. 1, possesses several notable features. The spindle cone is of three steps for a 4-in. belt and is back-geared 8 to 1. The arm is of steel; it is of large diameter and is provided with heavy braces. These braces can be attached to the arbor yoke or to the end of the arm itself, independently of the position of the yoke. The spindle is of forged crucible steel, and the front bearing is tapered and runs in a solid bronze self-oiling box and is fitted with hardened and ground thrust washers.

The construction of the knee is patented. It is absolutely closed on the top and sides, so there is no chance for the sides to spring, and no need for cover plates to protect the feed works. The bearing on the column is also extended upwards, thus increasing the stability and holding power of the knee on the column. The closed construction of the knee secures the perfect stiffness necessary to heavy cuts and forced feeds, and prevents all straining

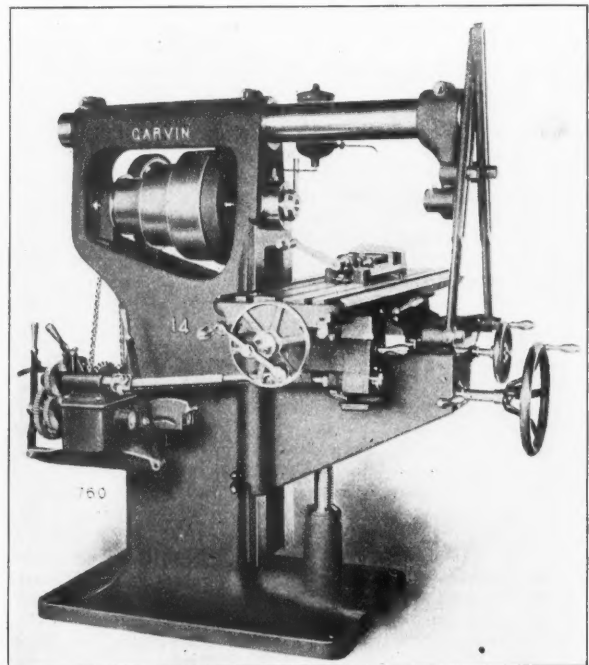


Fig. 1—The Garvin No. 14 Plain Milling Machine.

of the knee and fit of the saddle from overhung work. The saddle is fitted to the knee with a taper gib. The table is large and deep, and has a cast oil space all around, the top edge of the groove being finished, which adds to the effective working surface. The front and back edges of the table are also finished for convenience in squaring work. The table feed screw is extra large, and is provided with a quick pitch, which gives a movement of 1 in. per turn. The torsional stiffness of the large diameter secures steady feed under the heaviest loads, and the increased wearing surface assures durability.

The application of the power to the feed screw is direct, by means of a large bronze worm gear which is mounted on the screw itself, and which is driven by a hardened tool steel worm, running in an oil-bath. Reverse motion is provided for in the feed-box. The feed drive is through a change gear box in which fine feeds are positively driven from the spindle, and fast feeds are driven from the countershaft by a wide belt and large pulleys. This arrangement permits of changing instantly from spindle to countershaft feeds and instantaneous changes of rate are obtained by setting levers. The gears in the gear-box are hardened steel, and run in an oil bath. A safety shear-pin is provided in the gear box to prevent any damage that might occur from carelessness in setting the trips.

Tests made by the makers it is claimed have demonstrated that 30 per cent. of the power of the spindle belt is used in driving the

feed at fast rates; and when the feed is driven from the countershaft, the spindle power is increased by that much; and this saving, in addition to increasing the back-gearing and widening the belt, has resulted in more than doubling the power of the above tool. The table feed-screw has two nuts, one adjustable for take up. The saddle in and out screw is also provided with a take-up nut and the elevating screw of the knee is ball-thrusted, and telescopes, so that no hole is required in the floor. The hand-wheels on the knee are interchangeable, so that the large wheel can be used for the up and down or in and out adjustments, as most convenient. Micrometer adjustments are provided for feeds in all directions, and the spindle speeds are in geometrical progression. A number 10 Brown & Sharp taper hole is provided in the spindle, and a positive key-drive and screw draw-in rod is provided for the arbor. A speed range from 12 r.p.m. to 450 r.p.m. is provided, and feed ranges from .004 in. per turn of the spindle to over 12 in. per minute can be obtained. The machine can pull a cut  $\frac{3}{32}$  in. deep by  $5\frac{1}{2}$  in. wide, by 9 in. long per minute, with a single belt on the cone. The table has an automatic feed of 28 in. The adjustment in line with the spindle is 8 in. and the vertical adjustment under the spindle is 19 in. The weight of the machine complete is about 2,520 lbs.

Fig. 2 shows a No. 9 Bement vertical milling machine made by the Niles-Bement-Pond Company, New York. This machine is largely used in locomotive shops for finishing the ends of side and main rods, for milling mud rings of locomotive fireboxes, and for

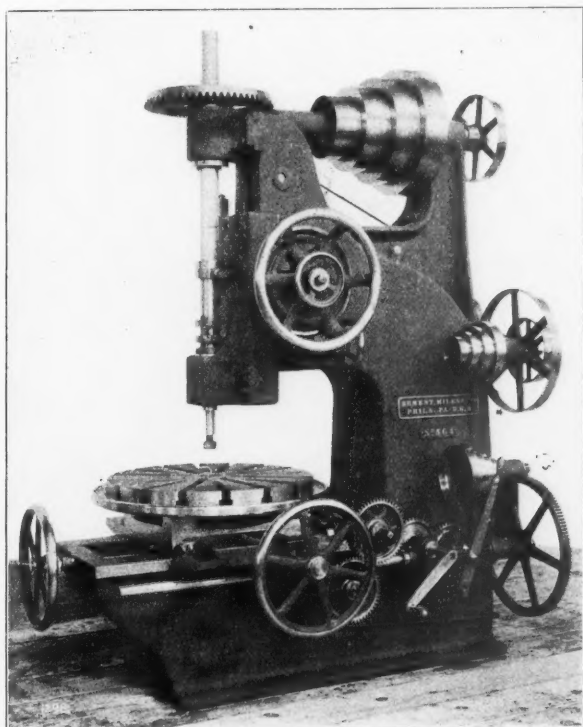


Fig. 2—The Niles-Bement-Pond No. 9 Vertical Milling Machine.

a variety of other work. In one or two shops, the jaws of the knuckle pin connections on the side rods are milled out on this machine. It has been found that for this work the vertical milling machine is much superior to the slotter. Milling machines of this type can also be used on work such as cylinder heads where it is necessary to machine the face of the heads and to finish the lugs which are cast directly on them.

The spindle of this machine is of steel 4 in. in diameter. It is counterweighted and at its lower end is held in a slide, which has a vertical traverse of 17 in. by hand. Automatic variable feeds can be provided when desired. The cutter mandrel is held in position by two circular nuts on the spindle, the lower one of which locks it in, and the upper one forces it out of the spindle. The distance from the center of the spindle to the inside of the frame is 26 in., and the vertical distance from the table to the underside of the frame is 16 in.

The compound tables have a movement of 28 in. longitudinally, and 28 in. transversely, and support a circular table with a working surface 32 in. in diameter. The tables are provided with four reversible feeds. The feed shaft for the circular table may be swung out of position to permit it to be rotated by hand for adjusting the work to position. Variable vertical feeds and copying attachments are provided when desired. A self-acting lubricating pump, with complete draining arrangements, is provided with each ma-

chine. The countershaft pulleys are 24 in. in diameter for a 5 in. belt, and they should run at 150 r.p.m.

#### Train Accidents in the United States in October.<sup>1</sup>

xc, 1st, Louisville & Nashville, Goodletts, Tenn., passenger train No. 93 ran over a misplaced switch and collided with some freight cars standing on a side track, and the engine was overturned; engineman and fireman injured.

\*xc, 1st, St. Paul, Minn., a freight train of the Chicago Great Western approaching a junction at uncontrollable speed, ran into the side of a passenger train of the Minneapolis, St. Paul & Sault Ste. Marie, and five passenger cars were thrown off the track. Two of these cars were overturned and fell to the foot of a 27-ft. retaining wall at the side of the track. One passenger was killed and five were injured. The wreck took fire, but the flames were quickly extinguished by the city fire department.

unx, 1st, 2 a.m., Louisville & Nashville, Birmingham, Ala., a switching engine running rapidly was derailed, and three trainmen riding on the front of the engine were killed.

dn, 3d, Cleveland, Cincinnati, Chicago & St. Louis, Terre Haute, Ind., a freight train was derailed at the derailing switch approaching the crossing of the Southern Indiana, and the engine and 10 cars were badly damaged. The engineman and fireman were killed and a man riding in one of the freight cars in charge of freight was injured.

dr, 4th, Baltimore & Ohio, Morgantown, W. Va., passenger train No. 1 was derailed by spreading of rails and three passenger cars fell down a bank. One trainman and eight passengers were injured.

bc, 4th, Chicago, Peoria & St. Louis, Hop Hollow, Ill., butting collision between a freight train and a work train, wrecking both engines; one engineman killed and six other employees injured.

xc, 5th, 3 a.m., Boyles, Ala., an empty engine of the Louisville & Nashville collided with a freight of the Southern Railway at a crossing; one employee killed, five injured.

unx, 5th, Chesapeake & Ohio, Colby, Ky., an empty engine was derailed and four employees were injured.

o, 6th, Williamsport & North Branch, Ringdale, Pa., the locomotive of a passenger train was wrecked by the explosion of its boiler; engineman killed, fireman fatally scalded.

rc, 8th, 4 a.m., Philadelphia & Reading, Royers Ford, Pa., a freight train taking water was run into at the rear by a following freight, badly damaging the engine and several cars. One fireman and one brakeman were killed.

rc, 8th, 4 a.m., Pennsylvania road, Millersburg, Pa., a passenger train ran into the caboose and one car of a preceding freight train which had become accidentally detached, and the caboose and car were wrecked. The fireman of the passenger train and two trainmen in the caboose were killed. There was a dense fog at the time.

dn, 8th, Jeffersonville, Ind., a freight train descending from the bridge over the Ohio river became uncontrollable and was derailed at a derailing switch by a signalman to prevent it from running into a passenger train which was approaching the junction from the north. The engineman and fireman jumped off, the former sustaining a broken leg.

bc, 9th, 3 a.m., Louisville & Nashville, Hopkinsville, Ky., butting collision of freight trains both running at full speed. Both engines and four cars were wrecked; one engineman and one fireman killed.

dn, 10th, Atchison, Topeka & Santa Fe, Newton, Kan., eastbound passenger train No. 8, while running at full speed, was derailed at a misplaced switch and the first three cars were ditched; three trainmen injured.

rc, 12th, Pennsylvania road, Coatesville, Pa., an eastbound freight train ran into the rear of a preceding freight, damaging six cars. A part of the wreck fell across the westbound track and was run into by a westbound freight train. One engineman was injured.

bc, 14th, Mobile & Ohio, Shubuta, Miss., butting collision between a southbound passenger train and a northbound freight, wrecking both engines and badly damaging several cars. Six trainmen and eight passengers were injured.

\*xc, 14th, Baltimore & Ohio Southwestern, Springfield, Ill., a westbound passenger train collided with two cars of coal which had escaped control on a side track and had run afoul of the main

<sup>1</sup>Accidents in which injuries are few or slight and the money loss is apparently small, will, as a rule, be omitted from this list. The official accident record, published by the Interstate Commerce Commission quarterly, is regularly reprinted in the *Railroad Gazette*. The classification of the accidents in the present list is indicated by the use of the following

#### ABBREVIATIONS.

- rc Rear collisions.
- bc Butting collisions.
- xc Miscellaneous collisions.
- dr Derailments; defects of roadway.
- eq Derailments; defects of equipment.
- dn Derailments; negligence in operating.
- unf Derailments; unforeseen obstruction.
- unx Derailments; unexplained.
- o Miscellaneous accidents.

An asterisk at the beginning of a paragraph indicates a wreck wholly or partly destroyed by fire; a dagger indicates an accident causing the death of one or more passengers.

track, and two passenger cars were ditched. One passenger was killed and three were injured.

\*unf, 15th, Iowa Central, Seaton, Ill., an eastbound freight train drawn by two engines was derailed by running over a cow, and both engines and 11 cars were wrecked. The wreck took fire and was mostly burnt up. Five trainmen were killed.

bc, 16th, Yazoo & Mississippi Valley, Crenshaw, Miss., butting collision between a freight train drawn by two engines, going north, and a work train going south. One trainman was injured.

unf, 16th, 2 a.m., Southern Pacific, Fresno, Cal., a passenger train was derailed at a misplaced switch and the engine was overturned, killing the engineman and fireman. Two cars were wrecked and a tramp was fatally injured. It is said that the switch had been maliciously misplaced.

unx, 16th, Missouri Pacific, Sugar City, Colo., a westbound passenger train was derailed and three passenger cars were overturned; 17 passengers injured.

bc, 16th, Pennsylvania road, East Sandy, Pa., butting collision of freight trains, wrecking both engines and several cars. One engineman was killed and one brakeman and one fireman injured. There was a dense fog at the time and it is said that the engineman of the northbound train mistakenly assumed that he had seen and passed the southbound at a station a short distance south of the point of collision.

17th, Colorado & Southern, Horse Creek, Wyo., a passenger train was derailed and two passenger cars fell down a bank. One employee and three passengers were seriously injured and 20 or more other passengers slightly.

unx, 17th, Louisiana & Arkansas, Minden, La., a freight train consisting of a number of empty log cars, drawn by a locomotive running backward, was derailed on a trestle bridge, and the engine and four cars were wrecked. One man riding on the engine was killed and two others were injured.

unx, 18th, Louisville & Nashville, Pittsburg, Ky., a passenger train was derailed on a curve and the engine was overturned. The first three cars were ditched. The engineman and fireman were injured, the former fatally.

re, 19th, Atlantic Coast Line, Wedgeville, S. C., freight train No. 82 ran into the rear of a preceding work train, wrecking the caboose. Two trainmen were killed and two injured. There was a dense fog at the time.

unx, 19th, Missouri Pacific, Nehawka, Neb., a freight train was derailed while crossing a bridge and the engine and two cars fell 25 ft. to the stream below. The engineman and fireman were killed.

bc, 20th, Seaboard Air Line, Portsmouth, Va., butting collision between a special passenger train and a switching engine; 20 passengers injured, most of them slightly.

xc, 20th, Southern Railway, Lima, Va., a freight train broke in two and the rear portion afterward ran into the forward one, damaging several cars. Three tramps riding in one of the cars were injured.

†dr, 20th, Denver & Rio Grande, Caliente, N. Mex., a passenger train was derailed by spreading of rails; one passenger killed and four injured, one of them fatally.

re, 21st, 4 a.m., Ann Arbor road, Shepherd, Mich., a freight train standing at the station was run into at the rear by a following freight, wrecking the engine, caboose and many cars. The engineman and one brakeman were killed.

re, 21st, Chicago, Burlington & Quincy, Otis, Colo., an empty engine ran into the rear of a preceding freight train, wrecking the caboose and injuring three drovers.

†rc. On the evening of the next day, the 22d, the same train was run into at the rear at Eckley, Colo., wrecking the caboose and several cars of sheep, and killing a drover riding in the caboose.

dr, 21st, Missouri Pacific, Fort Scott, Kan., a passenger train was derailed by a broken rail and five cars were overturned. About 30 passengers were injured, most of them slightly.

o, 21st, El Paso & South-Western, Escondida, N. Mex., the locomotive of a freight train was wrecked by the explosion of its boiler, and four trainmen were injured, all probably fatally.

bc, 22d, Illinois Central, Middleburg, Tenn., butting collision of freight trains, badly damaging both engines and several cars. Two men stealing a ride were killed. It is said that the southbound train ran past an appointed meeting place.

bc, 23d, 1 a.m., Oregon Short Line, McCammon, Idaho, butting collision of freight trains, making a bad wreck. The fireman, one brakeman and two tramps were injured, the tramps fatally.

\*23d, Gulf, Colorado & Santa Fe, Bangs, Tex., a string of freight cars which had escaped control and run from a siding to the main track collided with a freight train, wrecking the engine and several cars. The boiler of the engine exploded and a part of the wreck was burnt up. One man was killed.

dr, 23d, Southern Railway, Gadsden, Ala., a passenger train was derailed at a defective switch and two passenger cars were thrown against a freight car standing on a side track. The conductor and two passengers were injured.

o, 24th, Chicago & Eastern Illinois, Jackson, Ind., the locomotive

of a freight train was wrecked by the explosion of its boiler, and the engineman and two other trainmen were injured. Several freight cars were wrecked.

†bc, 26th, Chicago, Rock Island & Pacific, Fairfield, Iowa, butting collision between westbound passenger train No. 11 and eastbound passenger train No. 12, both running at good speed. Both engines were wrecked and 11 cars were badly damaged. One engineman, one mail clerk, one passenger and a tramp were killed, and five trainmen and 10 passengers were injured.

xc, 26th, Southern Railway, Jenifer, Ala., a freight train collided with another freight train which was on a side track but not clear of the main line, and both engines and several cars were wrecked. One engineman and one fireman were killed and a brakeman was fatally injured.

unx, 26th, Western of Alabama, Ethel, Ala., passenger train No. 35 was derailed at a switch and six cars were overturned. One passenger was injured.

unx, 27th, Louisville Southern, Lexington, Ky., the tender of the engine of a passenger train was derailed just as the train was approaching a bridge and, with the first three cars, broke through the bridge and fell 40 ft. to the creek below. Three trainmen and nine passengers were injured.

unx, 27th, Southern Railway, Norris, S. C., passenger train No. 11 was derailed and the engine and first three cars were overturned. The fireman was killed and three other trainmen were injured.

o, 27th, Southern Pacific, Yuma, Ariz., the locomotive of a freight train was wrecked by the explosion of its boiler, and the engineman and fireman were killed.

bc, 28th, Norfolk & Western, Nace, Va., butting collision between an extra freight train southbound and a local freight northbound, wrecking both engines and 20 cars. One engineman and one fireman were killed and several other trainmen were injured. It is said that the southbound train ran past the appointed meeting station.

unx, 28th, Mobile, Jackson & Kansas City, Stratton, Miss., train No. 18, consisting of a number of freight cars and one passenger car, was derailed and four freight cars fell down a bank; one on one side of the road and three on the other. Three men of a track repair gang were injured, two of them fatally.

eq, 29th, Baltimore & Ohio, Mariner's Harbor, N. Y., a gravel train was derailed by the breaking of the flange of a wheel, and one car and the caboose fell down a bank. Eight employees were injured.

o, 29th, Pennsylvania road, Dean's, N. J., the locomotive of a freight train was wrecked by the explosion of its boiler; fireman killed, engineman and one brakeman injured. The wreck blocked four main tracks several hours.

bc, 30th, Oregon Short Line, Border, Idaho, butting collision of freight trains, wrecking both engines and damaging several cars. Two trainmen and two tramps were injured, the tramps fatally.

†30th, Atchison, Topeka & Santa Fe, Sheffield, Mo., passenger train No. 1 was derailed and ditched in a cut while running about 50 miles an hour and several of the cars were piled up in a bad wreck. The car most completely wrecked was the smoking car, and the occupants of this suffered severely. Ten passengers and three employees were killed and 46 persons were injured. The engine was not derailed and the tender was so near the rails that the engineman and fireman got it back on the track in about 20 minutes and then carried messengers to the nearest station for help.

unx, 30th, Midland Valley, Pawhuska, Okla. T., a freight train was derailed and wrecked and three trainmen were injured, two of them fatally.

dn, 31st, 4 a.m., Louisville & Nashville, Mobile, Ala., passenger train No. 3 was derailed in consequence, it is said, of a mistake in signaling, and the engineman and four other persons were injured.

#### Foreign Railroad Notes.

A German student finds one of the causes of the inability of the Russian railroads to handle their traffic is the antiquity of their locomotives. The number of these seems in tolerable proportion to the traffic, but out of 14,326 locomotives no less than 6,919 are from 24 to 46 years old. However well these may have been maintained, engines of that age are comparatively light. Recently an important part of the stock has been drafted into service in Siberia, and these, we may be sure, were among the best ones.

The Russian authorities have established greatly reduced rates on forage and fodder grains to the provinces where the crops failed last summer, and have ordered that such shipments shall have preference in time over other freight. It has been the experience in other seasons of short crops that the peasants have lost their stock for want of feed, and then the next year were crippled for lack of draft animals. Low freights did them little good because, waiting their turn on lines overcrowded after harvest, the forage did not reach them in time to save the stock. No reduction is made on bread grains, except for seeding.





# GENERAL NEWS SECTION

## NOTES.

The Rutland Transit Co. (Rutland Railroad) has ordered two additional steamers for service between Ogdensburg, N. Y., Milwaukee and Chicago.

The Supreme Court of South Carolina has sustained the decision of a Magistrate's Court imposing on a railroad the statutory penalty of \$50 for failure to adjust a freight damage claim within 40 days.

The Atchison, Topeka & Santa Fe recently carried from California to points in Texas, Arkansas and Missouri, 9,450 sacks of potatoes. The potatoes were shipped from Stockton and filled 35 cars.

In the Supreme Court of the United States, twenty-seven railroads operating in the State of Michigan have made appeals in the suit brought to test the validity of the tax law of Michigan, passed in 1901.

An officer of the Pere Marquette road announces that his company and others in Michigan have given notice of withdrawal from the Central Passenger Association Mileage Ticket Bureau, and on February 1 will resume the sale of the "Northern" mileage ticket.

The railroad members of the joint committee of railroads and shippers recently established in Ohio, are G. W. Davis, General Freight Agent of the C., A. & C., Columbus; A. E. Billings, Division Freight Agent of the Lake Shore, Toledo, and J. H. Hackett, Division Freight Agent of the Erie, Galion.

A press despatch from Texas says that the ticket brokers of El Paso, having been asked by the Chamber of Commerce of that city to refrain from dealing in excursion tickets which are to be issued for a mining congress which is to meet there, have promised to comply with the request, and have given a bond for \$10,000 as an assurance of good faith.

The planting of trees for timber by the Pennsylvania Railroad, which has been carried on now for several years, has reached a point where the total number planted is given as 477,299. An officer of the company is reported as estimating the number of sleepers needed for the road annually at 3,850,000, which would require the cutting of about 1,300,000 trees.

According to a Chicago press dispatch, the Chicago & Alton is to have "train auditors" on all passenger trains; men who will go through the train with the conductor and "check up" the collections. The train auditor is spoken of as an innovation. In the sense that the employment of two men to act jointly in collecting tickets and fares is old enough to have been forgotten, the idea may be called new, but it was in use on the Baltimore & Ohio something like thirty years ago.

The newspapers have recently revived the report, which has been circulated repeatedly within the last six or eight years, that the Pennsylvania Railroad was about to lay underground telegraph wires between New York and Philadelphia; and the report is now amplified to include the division west of Philadelphia; but an officer of the road informs us that the company is simply making investigations; that it is not at all likely that anything will be done within the next year.

General Passenger Agent Moody, of the Pennsylvania Lines West of Pittsburgh, announces that, by an overwhelming vote, the passengers on the Pennsylvania 18-hour trains between New York and Chicago favor the present times of departure and arrival at the termini. For two weeks each passenger on the trains has been asked to vote on the question of changing the hours. The degree of overwhelmingness is not stated, but the number of votes of westbound passengers in favor of continuing the present arriving time at Chicago (8:55 a.m.) was 460, and of eastbound passengers in favor of continuing the present arriving time at New York (9:45 a.m.) was 420.

### Bids for London City Council Improvements.

A contract has been let to J. G. White & Co., Ltd., the London connection of J. G. White & Co., electrical engineers of New York, for building a number of miles of track for the London City Council to cost a million dollars. Bids will shortly be invited by the London City Council for the reconstruction for electric traction of the first 22½ miles of the Northern system, which has just been bought from the North Metropolitan Company. The work will begin in April, 1906, and is to be finished by the end of the year. The track for the conduit system, it is estimated, will cost about \$2,000,000, and the cars, electric cables and switchboards

about \$1,000,000. Four bridges over railroads will be built or widened at a cost of \$120,000, and two new car barns, as well as three sub-stations built, calling for an outlay of \$550,000, making a total estimated cost of \$4,000,000. A contract has already been let for 4,210 tons of rails, at \$35.70 per ton, to a Middlesboro concern. An American tender was lower but was thrown out because it did not comply with certain specifications. The contract calls for about \$150,000 worth of material. In addition to the foregoing there are two sections of 46 miles and 36 miles of track on the Northern lines, which are shortly to be reconstructed. These new lines will also necessitate the purchase of large quantities of power generating machinery.

### The Recent History of Federal Control of Railroads in the United States.\*

BY W. M. ACWORTH.

(Continued from page 154.)

The history of Federal intervention in railroad regulation begins with the year 1866, in which year an Act to Facilitate Communication between the states was passed by Congress, providing that railroads in any one state might connect and exchange traffic with railroads in any other state. Presumably this statute was passed for merely legal reasons and only recognized and perhaps legalized what had already in very many instances been carried out in practice. Congress exercised its constitutional power to regulate—in the sense of making regular—commerce among the several states; but regulation, in the sense of control, it still left to the individual states. About the same time Congress also granted charters and gave subsidies to certain railroad companies, the Union Pacific more especially, so as to secure the closing up of the gap between the Atlantic and the Pacific States. But this power Congress exercised not so much as the supreme national authority as in its capacity of governing authority of those portions of the territory of the United States not yet included within the territory of any state. Another 20 years had to pass before the country as a whole was ripe for Federal legislation on the railroad question. The proportion of the whole volume of traffic that was merely intrastate was rapidly decreasing. All other traffic escaped state regulation. If Congress did nothing, it was uncontrolled. The railroad companies were a law to themselves, and their own law they often honored more in the breach than in the observance.

In 1887, after an exhaustive inquiry which elicited valuable evidence and resulted in a valuable report, the Act to Regulate Commerce, more commonly perhaps called the Interstate Commerce Act, was passed by Congress. Like most acts of the kind, it was a compromise measure, representing, not without some degree of success, an attempt to amalgamate into a single Act a very radical bill introduced by Judge Reagan, of Texas—afterwards for many years chairman of the Texan State Railroad Commissioners—and a much more conservative bill fathered by Mr. Cullom, then and still in 1905 Senator from Illinois.

The Act to regulate Commerce of 1887, which was amended in certain points of practical rather than theoretic importance in 1889 and again in 1893 and 1903, may be dealt with under three heads. [Let me once more repeat: "commerce" for Congress is "interstate commerce only." Intrastate commerce lies beyond its province.] All three heads are concerned with regulation of rates and that only. It was not till later that Congress dealt with matters falling under what I have described as the police power. The first portion of the Act lays down the law to bind railroads as carriers of passengers and merchandise, or rather—what is perhaps, with one exception, a more accurate statement—declares and particularizes the common law obligations which already bound them. The second portion requires the publicity of all rates and gives rules for publication. The third portion is wholly what Austin calls "adjective law." It creates an Interstate Commerce Commission, defines their duties, and provides machinery for the enforcement of the law and penalties for its violation.

The first portion of the Act, in language largely borrowed from our Railway and Canal Traffic Act, 1854, enacts in effect:

1. That all charges must be reasonable and just.
2. That no charge shall unjustly or unreasonably discriminate between (a) persons (b) places.

Two sections, however, as the Scotch say, "condescended upon details" Section 4, the famous "long and short haul" clause—next year incorporated, fortunately in a quite innocuous form, in our Railroad and Canal Traffic Act, 1888—requires that, under substantially similar circumstances, the rate for a short distance shall

\*A lecture delivered on Oct. 25, at the School of Economics, University of London.

be at least not higher than the rate for the long distance of which it forms a part. The law-courts have, it may be here mentioned, of recent years drawn the teeth of this section by decisions that serious competition creates a state of circumstances substantially dissimilar. [Compare the decision of our own Courts of Appeal, and especially Lord Herschell's masterly judgment, in the case of *Pickering Phipps vs. the London & North-Western Railway*.] Section 5—which came from the Reagan bill—the equally famous "anti-pooling section," forbids either the diversion of competitive traffic from one route to another so as to make up agreed percentages of the total, or the division under a joint purse agreement of the total receipts from such traffic. But the pooling question is of such importance that I must deal with it at more length hereafter.

Section 6 requires that all rates for goods and passengers shall be published by being (a) printed and made available for public inspection, and (b)—which is a great improvement upon our English legislation, which provides for no one central point where all rates are accessible—filed with the commission. As showing the vast magnitude of the subject, it may be here stated that in the one year, 1903, over 165,000 tariffs were filed with the commission. And this, be it remembered, is interstate commerce only. Published tariffs may not be departed from upwards on less than ten, or downwards on less than three days' notice. Perhaps, as showing the temper in which some railroad magnates were at the outset prepared to receive new legislation—legislation which in the opinion of all competent and impartial observers was abundantly required—I may here mention an incident from my own recollection. Shortly after the Act came into force, a prehistoric boat was dug up somewhere on the shores of New England. It was acquired for the Boston Museum, and the railroad company was asked to carry it gratis. The company solemnly published and filed a tariff, "Boats constructed before the year 1600, cents per 100 lbs. 0"; waited three days, and then carried the boat.

The third portion of the Act provides for the appointment of a commission of five members to enforce the Act, and enacts that not more than three shall be members of the same political party. A recognition, based presumably on Gilbertian authority, of the fact that man is a political animal, but which, though doubtless well intentioned, has ever since afforded opponents of the Act an opportunity of saying that the Commissioners are by the law of their being political partisans. The Commissioners, a very hard worked body, are each paid £1,500 a year; whereas our Railroad Commissioners, whose duties are by no means equally arduous, are paid just double.

The commission is empowered to investigate any matter within the scope of its duties, either of its own motion, or on the application of any complainant, and for this purpose it has power to call for and to order the production of any necessary persons or papers. It may deal with any matter, either by an informal process of conciliation—a power given to our Railroad Commission in 1873, but withdrawn by the Act of 1888—or by a formal hearing. Should the commission decide against a railroad company, it cannot enforce its own decision, but must apply to the Attorney-General or one of his deputies to proceed in an ordinary Federal Law Court for its enforcement. In any such proceedings the findings of fact of the commission are to be regarded as "*prima facie* evidence." It will be observed that the commission is not a law court, like our Railroad Commission, enforcing its own orders. And, indeed, so long as it retains its present executive functions, it could not constitutionally, as I have already pointed out, be made a law court. Its members usually are, but are not required to be, lawyers. It combines, as has been pointed out, the incongruous functions of executive officer, detective, judge, and prosecutor, with a further function implied in the obligation to report to Congress what alterations, if any, of the law are required.

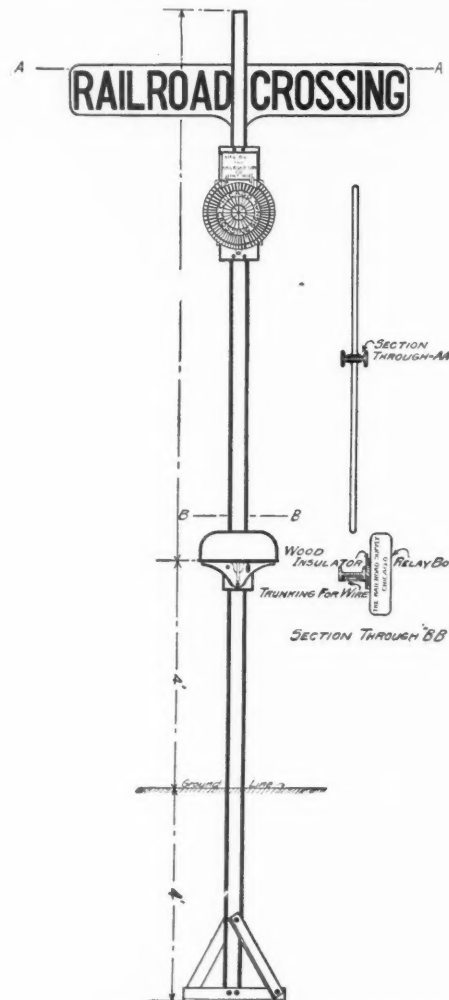
That the commission has not been entirely a success is admitted. Perhaps in the circumstances five archangels would not have succeeded either. That they have succeeded as well as they have, in spite of the fact that the salaries were wholly inadequate to command first-class men, that the post has often been made a mere political reward, that men with special railroad experience have been sedulously excluded, is surely high testimony both to the honesty, intelligence and diligence of the commissioners and to the reasonableness of the vast majority of the railroad managers. The following summary of the work of the commission has been published. In the five years 1900-5, there were made to the commission 2,296 informal complaints—complaints, we may suppose, similar to those made to our Board of Trade under the Conciliation Section of the Act of 1888—and 2,171 of these were satisfactorily disposed of. Formal complaints since the establishment of the commission in 1887 have numbered 770. The vast majority of those which have not been withdrawn have been settled either by the commission finding in favor of the railroad company or by the railroad company complying with the decision of the commission. Only in a very small fraction of the cases has the commission found it necessary to apply to a court to enforce its order.

Where it has done so, its success has not been great. In the last five years it has made 22 final orders. Fourteen of these were obeyed by the companies without litigation, and of the rest five were upset on appeal, three were not obeyed, and in these cases (if I understand the figures rightly) the commission did not venture to attempt to obtain the enforcement of the order.

(To be continued.)

#### Crossing Sign and Bell Pole for Highways.

A new design of crossing sign and bell pole for highways is shown herewith. An upright I-beam has bolted to it two malleable iron signs, each of which has the words "railroad" and "crossing" on opposite sides in raised letters, thereby guarding both directions. These raised letters allow frequent painting, enabling a neat sign to be maintained at small cost. Strength and durability both were sought in the construction of the pole. The bottom has extra angle braces, which are buried in the ground and make unnecessary a concrete foundation, usually essential for a metal pole.



A New Highway Crossing Sign and Bell Pole.

The pole supports a relay box and crossing alarm bell, insulating material being used for mounting the box and bell. The trunking carrying the wires conforms to the web of the pole and is so arranged that no wires are exposed. Access to any wire or part is readily obtained by releasing one or two screws. A preservative paint covers the pole and trunking. The superiority of this design to a wooden pole in strength and durability is obvious. Lightning striking this pole would reach the ground without doing damage, whereas a wooden pole would probably be defaced or destroyed. The steel pole requires no attention or repairs, other than an occasional renewal of paint on the sign. The pole is also furnished without the wire trunking and insulated parts for use as a highway crossing sign. It is made by the Railroad Supply Co., Chicago.

#### Fifteen-Year Contract for Fuel Oil for the Mexican Central.

The Mexican Central Railroad has contracted with the Mexican Petroleum Co. to supply the road with fuel oil for all its locomotives for 15 years, an estimated quantity of 45,000,000 barrels of oil. The present production of the wells, which are near Ebano is about 2,000 gallons a day, while the average consumption on

the Mexican Central with all its locomotives burning oil would be about 8,000 barrels; but the petroleum company has considerable development work under way and expects to be able to supply the required amount. It has two reservoirs, one with a capacity of 500,000 barrels and the other of 225,000 barrels. Work is to be started at once on an additional reservoir that will hold 1,000,000 barrels. One condition of the contract is that there shall be a saving to the road of 20 per cent. on its cost of fuel.

#### A New Railroad Equipment Co.

The Baltimore & Ohio Equipment Co., of Wilmington, Del., filed a certificate of incorporation in Dover, Del., last week. The object of the company is to deal in rolling stock and railroad equipment. The incorporators are Andrew E. Sanborn, Henry A. Miller and Robert M. Burns, all of Wilmington, Del. Capital stock \$1,000,000.

#### A Correction.

The Mr. Condict quoted in an editorial on "Motor Drive for Railroad Shop Tools," in our issue of November 17, was Mr. G. Herbert Condict, Vice-President of the Electro-Dynamic Company, Bayonne, N. J., and not Herbert T. Condict, as erroneously stated.

#### The New North-Western Limited.

The Chicago & North-Western placed in service last week new equipment for its "North-Western Limited" trains between Chicago, St. Paul and Minneapolis, built by the Pullman Company. The various roads between these cities have for years vied with one another in trying to excel in the quality of the equipment for their crack trains in this service. The North-Western's trains now being the newest, are naturally claimed to be the finest and embody some new features. Chief of these is a new arrangement for the sleeping cars. The straight compartment car has been dispensed with, and instead private compartments are provided in each section sleeping car. These cars have ten sections, a drawing room with annex and two private compartments, or ten sections and three compartments to the car. A diagram of the latter arrangement is shown. These compartments are slightly larger than the usual stateroom. Also the berths in these cars are several inches larger than the standard. An innovation in the toilet rooms is the use of porcelain washstands.

The interior decorations of the train are green and gold, the



Floor Plan of New Sleeping Cars for the "North-Western Limited."

upholstery being olive green plush or green leather, with hangings and carpets to harmonize. A good feature in the day coaches, which include a reclining chair car, is wide decks, which give an air of roominess. The train is electrically lighted throughout from a dynamo in the baggage car, the illumination being exceptionally good. This is particularly noticeable in the chair car, where an extra row of incandescent lamps on the lower edge of the deck on each side makes the car as light as day and reading comfortable employment.

#### A Slur on the L. & S. W.

Mr. Binks.—"One of my ancestors fell at Waterloo." Lady Clare.—"Ah? Which platform?"—*Punch*.

#### Manufacturing and Business.

The Baldwin Locomotive Works, it is reported, is to erect a large building, which will be devoted exclusively to the making of electric trucks.

The Riverside Bridge Company's works at Martin's Ferry, Ohio, were damaged by fire Nov. 17; loss about \$200,000. All of the iron and steel buildings were completely destroyed. The cause of the fire is unknown.

Frederick H. Stevens, formerly President of the Brooks Locomotive Works, has been elected Chairman of the executive committee of the American Locomotive Co. He will be, temporarily, the official head of the company.

It is expected that the Harlan & Hollingsworth Corporation will soon begin work on the new car shop at Wilmington, Del., which was planned some months ago. The new building is to be 500 ft. long and 90 ft. wide and will be of brick and steel.

The Helwig self-feeding tube expander with alarm attachment, made by the Helwig Manufacturing Company, St. Paul, Minn., is said to be meeting with much favor among its users, as it does away with a sectional expander its cost and labor to operate the same and indicates when the flue is sufficiently rolled.

The Crocker-Wheeler Company, Ampere, N. J., manufacturers and electrical engineers, announce the establishment of an Indus-

trial Engineering Department, in which is concentrated all their work in the line of industrial engineering as applied to railway shops, machine shops and industrial plants of every description.

Work on the New York State barge canal has so far advanced that it is expected that additional contracts will be let next month. A delegation from the Utica Chamber of Commerce is urging the State Engineer to favor legislation to utilize the old Chenango Canal in giving that part of the state a more direct channel route to the soft coal regions. Such a bill was introduced at the last session of the Legislature.

The Independent Pneumatic Tool Company, of Chicago, has opened an office at 207 Germania Bank Building, Pittsburg, at which place it will carry a complete line of Thor piston air drills, reversible flue rolling, reaming, tapping and wood boring machines, and pneumatic riveting, chipping, calking and beading hammers. Richard D. Hurley has been appointed Manager of the office. James C. Dennis, well known in the pneumatic tool business, has also been appointed as salesman, and will travel out of the New York office.

The Lidgerwood Manufacturing Co., New York, has awarded the Miller-Collins Co., New York, the general contract for its new plant at Waverly, Newark, N. J. The buildings will cover upwards of 9 acres when the plant is completely finished, and will cost approximately \$500,000, exclusive of machinery and land. The construction will consist of reinforced concrete, structural steel, and brickwork, with wood and slag roof over foundry. The Miller-Collins Co. are in the market for prices on piling, cement, sand, crushed stone, common brick, spruce and pine lumber, windows and sash, doors, skylights, sheet metal work, flooring, structural steel (about 500 tons), tin covered doors, painting, etc., etc.

The Baltimore & Ohio Equipment Co. has been incorporated in Delaware with a capital of \$1,000,000 to buy, lease or otherwise acquire railroad rolling stock, and to buy, sell and deal in engines, cars, machinery, tools and general railroad equipment. The incorporators are: Andrew E. Sanborn, an attorney for the Baltimore & Ohio Railroad Company; Henry A. Miller, traveling passenger agent of the B. & O., Wilmington, Del., and Robert M. Burns of Wilmington.

Carl A. Strom has resigned as Superintendent of Motive Power and Machinery for the Isthmian Canal Commission at Panama and accepted the position of Works Manager of the Bucyrus Co., South Milwaukee, Wis., builders of steam shovels, dredges, etc. Mr. Strom is well known as the former Mechanical Engineer of the Illinois Central, with headquarters in Chicago, who resigned in May, 1904, to accept a similar position with the Isthmian Canal Commission. He was the first Engineer under the Commission to go to Panama, having preceded Mr. Wallace by a month. He found the shops of the old French company, after twenty years' idleness, practically buried in the jungle, in a generally dilapidated condition, and inside of a year's time Mr. Strom had four shops in complete commission, and had overhauled and put in service over 75 of the Belgian locomotives and hundreds of the French cars.

The continually increasing business of the American Blower Co., Detroit, Mich., has made necessary a three-story addition to the plant, which will be devoted entirely to the production of the Type A enclosed, vertical, self-oiling engine which has been on the market only two or three years and for which there is a growing demand. The building will be of steel and brick. The first floor will be used for erecting and testing engines, a very complete new outfit being put in for testing. The power from engines under test will be absorbed by generators and air compressors. An electric crane will form part of the equipment in this department. The second floor will be used for storing engine parts and painting the completed engines, and the third floor will be entirely for storage.

#### Iron and Steel.

The Boston & Maine has given an order for 25,000 tons of rails for delivery early in 1906.

Contracts for rails aggregating between 85,000 and 90,000 tons have been signed recently for 1906 delivery, as follows: Illinois Central, 39,000 tons; Chicago, St. Paul, Minneapolis & Omaha, 4,000 tons; an Indiana trolley road, 2,500 tons, and 10,000 tons supplementary orders for another railroad. All bids for steel for the Northwestern Elevated at Chicago have been rejected. Tenders were made on 8,000 tons of fabricated steel for the extension of this line from Chicago to Evanston, Ill. New bids will be asked for. The Duluth, Missabe & Northern has let contracts for 2,900 tons of bridge material in lots of 1,500 and 1,400 tons each to the American Bridge Co. A bridge contract was let by a road in Texas for 350 tons. Contracts are pending for structural shapes aggregating 50,000 tons. It is said that lake shipyards are figuring on contracts for 12 more lake vessels.

## MEETINGS AND ANNOUNCEMENTS.

(For dates of conventions and regular meetings of railroad conventions and engineering societies, see advertising page 24.)

## Master Car Builders' and Master Mechanics' Committee Meeting.

The Executive Committees of the Master Car Builders' and Master Mechanics' Associations will meet at the Manhattan Hotel, New York, December 11th, to listen to a report of the joint subcommittee on time and place for the 1906 conventions. The location will probably then and there be decided.

## PERSONAL.

—Mr. Albert J. Pitkin, President of the American Locomotive Company, died at his home in New York City on November 16. He had been ill for several months, but his death was unexpected. Mr. Pitkin was born in Ohio in 1854, and at the age of 17 went, as an apprentice, into the stationary engine works of the Webster, Camp & Lane Machine Co., of Akron, Ohio. Having received his certificate, he spent a year in the locomotive repair shops of the Cleveland, Akron & Columbus, after which he entered the drawing office of the Baldwin Locomotive Works. Five years later, he became



A. J. Pitkin.

Chief Draftsman of the Rhode Island Locomotive Works, and in 1882 was appointed Mechanical Engineer of the Schenectady Locomotive Works. He became Superintendent of these works in 1884 and was later made Vice-President and General Manager. When the American Locomotive Company was organized, Mr. Pitkin was elected its First Vice-President, and on the death of S. R. Callaway, in June, 1904, became President.

Mr. Pitkin was thorough and enthusiastic in the same measure that he was unassuming and approachable, and his personality inspired his associates and subordinates to their best efforts. He was an example of the unusual combination of high scientific talent with the executive ability necessary to the control of men and the management of a great corporation. To him is due a great deal of the credit for the development of the present high power locomotives, especially in the marked advance in the capacity of passenger locomotives, which began 12 years ago and reached its present high level in the large Prairie type locomotives recently built. More specifically, Mr. Pitkin's influence was shown in the introduction of wide fireboxes, and in the increase of steaming capacity through the use of larger boilers. The application of the Walschaerts valve gear received his careful attention, as did also the introduction into this country of the principle of the Mallet compound.

—Mr. J. M. Connell, who was recently appointed General Passenger Agent of the Atchison, Topeka & Santa Fé, began railroad work in 1879 as a clerk in the freight department of the Chicago, Burlington & Quincy. Two years later he went into the law department as a stenographer, where he staid about one year. He then was connected with the Northwestern Traffic Association and in 1883 returned to the Atchison as a freight and passenger clerk. The next year he became Traveling Freight and Passenger Agent for the Chicago, Milwaukee & St. Paul, and in 1889 was appointed City Passenger Agent of that road at Chicago. After about three years he went again to the Atchison, as General Agent of the passenger department at Chicago, where he remained until his recent appointment.

—Mr. A. C. Dennis, recently appointed Division Engineer at



J. M. Connell.

Winnipeg of the Grand Trunk Pacific, has been on the Grand Trunk and the Grand Trunk Pacific for five years as Division Engineer of Construction, excepting one year, when he was in West Virginia as Chief Engineer of the Atlantic & Western. His railroad work has been in the engineering department of the Pennsylvania Lines West, the Southern, the Great Northern, and the Butte, Anaconda & Pacific. Before coming to the Grand Trunk Pacific he was Assistant Engineer of Construction of the Columbia & Western.

## ELECTIONS AND APPOINTMENTS.

*Atlantic Coast Line.*—R. G. Erwin, President, has resigned. T. M. Emerson, Third Vice-President, succeeds Mr. Erwin.

*Central of New Jersey.*—W. C. Smyth has been appointed Assistant Auditor of Passenger Traffic, with office at Philadelphia, Pa.

*Chicago, Burlington & Quincy.*—The title of W. F. Ackerman, Master Mechanic at Havelock, Neb., has been changed to Superintendent of Shops at that place.

*Colorado & Southeastern.*—C. H. Bevington, Superintendent has resigned. J. H. Abrams, formerly Superintendent of Terminals of the Missouri Pacific at Little Rock, Ark., succeeds Mr. Bevington, with office at Trinidad, Colo.

*Denver, Enid & Gulf.*—W. D. Gerber, Acting Chief Engineer, having been assigned to other duties, B. J. Dalton has been appointed Chief Engineer, with office at Enid, Okla. T.

*Detroit, Toledo & Ironton.*—The office of F. A. Durban, President, has been removed from Zanesville, Ohio, to New York.

*Erie.*—Russell Harding, Vice-President in charge of operation and maintenance, has resigned.

*Gulf, Colorado & Santa Fe.*—Y. Van den Berg, Assistant General Freight Agent at Galveston, Tex., has resigned.

*Manitoba & Midland.*—The officers of this new company are: President, James Fisher; Vice-President, H. Swinford, both with office at Winnipeg, Man., and Chief Engineer, P. E. Thian, with office at Portage la Prairie, Man.

*Michigan Central.*—S. P. Hutchinson, General Superintendent, has resigned. H. A. Worcester, Assistant General Superintendent, succeeds Mr. Hutchinson, with office at Detroit, Mich.

*Pere Marquette.*—P. F. Gaines, Assistant General Freight Agent, has been appointed General Freight Agent, with office at Detroit. The office of Assistant General Freight Agent has been abolished.

*Rock Island, Arkansas & Louisiana.*—The officers of this subsidiary Rock Island company recently consolidated are: President, A. E. Sweet, with office at Ruston, La.; Vice-President, E. B. Pierce; Secretary and Treasurer, T. S. Buzbee, both with office at Little Rock, Ark.; and Assistant Secretary and Assistant Treasurer, G. H. Crosby, with office at Chicago, Ill.

*Suffolk & Carolina.*—The officers of this company are: J. T. Odell, President; F. E. Dewey, Vice-President; J. H. Force, Secretary and Treasurer; Joseph T. Odell, General Freight and Passenger Agent; A. N. Bullock, Chief Engineer. The office of the President is at New York; all other offices are at Norfolk, Va.

*Tennessee Central.*—W. C. Collier has been elected Vice-President.

*Texas & New Orleans.*—G. W. Vanderslice, Assistant Superintendent, has resigned. M. Sheehan, Superintendent of Maintenance and Water Service of the Fort Worth & Rio Grande, succeeds Mr. Vanderslice, with office at Houston, Tex.

*Wabash.*—R. F. Kelly has been appointed Assistant General Passenger Agent, with office at Chicago, succeeding F. A. Palmer.

A. E. Robbins, Superintendent of the Buffalo division, has resigned, and the authority of C. S. Cunningham, joint Superintendent at St. Thomas, Ont., of this road and of the Grand Trunk, has been extended over the Buffalo Division.

## LOCOMOTIVE BUILDING.

*The Delaware & Hudson* will build five D-3-B type locomotives at its own shops.

*The Illinois Central* is reported to be in the market for a number of locomotives.

*The Pittsburg, Cincinnati, Chicago & St. Louis* is reported to have ordered 50 locomotives.

*The Chicago, Rock Island & Pacific* has ordered 50 locomotives from the Baldwin Locomotive Works.

*The Pennsylvania*, as reported in our issue of November 17, has ordered 250 locomotives from the Baldwin Locomotive Works. Fifty of these locomotives will be H-6b consolidation freight locomotives, and the remaining 200 of a class or classes yet to be determined upon.

*The Norfolk & Western*, as reported in our issue of November

3, is in the market for 50 twelve-wheel locomotives. These engines are to weigh 200,000 lbs., with about 168,000 lbs. on the drivers; cylinders, 21 in. x 30 in.; diameter of drivers, 56 in.; radial stay wagon top boiler, with 200 lbs. working steam pressure; heating surface, about 2,943 sq. ft.; 258 charcoal iron tubes, 2½ in. in diameter x 18 ft. 4¼ in. long; firebox, 8 ft. 3¾ in. x 5 ft. 4¼ in.; grate area, 44.5 sq. ft. The tender will have a capacity for 6,000 gallons of water and 10 tons of coal. The special equipment will include: Westinghouse air-brakes, hammered iron axles, except main wheel, which will be 3½ per cent. nickle steel; Keasby & Mattison boiler lagging, Perfecto brake-shoes, Norfolk & Western standard headlights, Monitor injectors, U. S. metallic piston and valve rod packings, Leach sanding devices, Nathan sight-feed lubricators, Railway Supply Co.'s springs, Crosby steam gages, Latrobe driving and truck wheels, cast-iron tender wheels and cast-steel wheel centers.

The Cincinnati, New Orleans & Texas Pacific has ordered three six-wheel switching engines from the Pittsburgh Works of the American Locomotive Co. for February, 1906, delivery. These locomotives will weigh 145,000 lbs.; cylinders, 20 in. x 26 in.; diameter of drivers, 50 in.; radial stay wagon top boiler, with a working steam pressure of 185 lbs.; total heating surface, 2,486.5 sq. ft.; 300 tubes, 2 in. in diameter x 15 ft. 1½ in. long; firebox, 66 in. x 66 in.; grate area, 29 sq. ft.; tank capacity, 4,000 gallons of water and seven tons of coal. The special equipment will include: Westinghouse air-brakes, Otis steel axles, Simplicity bell ringers, Keasby & Mattison magnesia boiler lagging, Buffalo brake-beams, cast-iron brake-shoes, Climax and Hennessey couplers, Dressel headlights, Monitor injectors, Ajax journal bearings, Sullivan piston and valve rod packing, Hayden safety valves, Watters sanding device, Chicago sight-feed lubricators, Railway Steel Spring Co.'s springs, Ashton steam gages, Latrobe driving wheel tires, cast-steel wheel centers, Homestead's blow-off cock, Phillips boiler check, reflex water gages, Linstrom eccentrics and tank syphons.

#### CAR BUILDING.

The Southern is asking bids on 1,000 self-clearing hopper coal cars.

Morris & Company, Chicago, will build 100 fruit cars in its own shops.

The Buffalo & Susquehanna is reported in the market for passenger cars.

The Pittsburgh & Lake Erie is reported in the market for passenger cars.

The Pittsburgh, Cincinnati, Chicago & St. Louis has ordered 5,000 freight cars.

The New York Central & Hudson River is reported to be in the market for 300 passenger cars.

The Louisville & Nashville has ordered additional passenger equipment from Barney & Smith.

The Northern Pacific has ordered 500 steel underframe dump cars from the American Car & Foundry Co.

The Lake Shore & Michigan Southern has ordered 1,000 furniture cars from the American Car & Foundry Co.

The New York, Chicago & St. Louis, it is reported, is in the market for upwards of 5,000 box and stock cars.

The Chesapeake & Ohio has ordered 1,000 steel underframe gondola cars from the American Car & Foundry Co.

The Kelly's Creek & Northwestern has ordered 100 40-ton gondola cars from the American Car & Foundry Co.

The Lansing & Suburban Traction Co. is reported to have ordered four interurban cars from the St. Louis Car Co.

The Duluth, Missabe & Northern has ordered 250 steel ore cars of 100,000 lbs. capacity from the Standard Steel Car Co.

The Missouri Pacific is in the market for additional freight equipment, and, it is reported, is figuring on steam motor cars.

The Illinois Central is reported to have ordered a number of box and refrigerator cars from the American Car & Foundry Co.

The Great Northern is in the market for 1,000 box cars and has ordered 500 additional ore cars from the American Car & Foundry Co.

The Montreal Street Railway has set aside \$1,000,000 for the purchase of new rolling stock and for the erection of new feeder lines next year.

The Colorado & Southern is reported to be figuring on 1,000 box cars; also a number of stock cars, flat cars, gondola cars and additional dump cars.

The Atlantic & Birmingham Construction Co. has ordered 13

passenger cars from the American Car & Foundry Co. and three passenger cars from F. M. Hicks & Co.

The Delaware, Lackawanna & Western is in the market for 18 milk cars, 15 passenger cars, 10 express cars, three combination passenger and baggage cars and two coaches.

The Minneapolis, St. Paul & Sault Ste. Marie, as reported in our issue of November 17, has ordered four twelve-section sleeping cars and six day coaches from Barney & Smith.

The Chicago, Burlington & Quincy has ordered 200 refrigerator cars and 250 ore cars from the American Car & Foundry Co., and 1,000 gondola cars from the Standard Steel Car Co.

The Pennsylvania has ordered 600 box cars and 2,500 hopper cars from the American Car & Foundry Co. These are in addition to the large orders placed by this company which have already been reported.

The Pittsburgh Railways have ordered 100 closed vestibule passenger cars from the St. Louis Car Co. These cars will be 44 ft. 6 in. long x 7 ft. 10 in. wide over all, and 8 ft. 6 in. high from the under side of sill to the top of the roof.

The Ocean Shore has ordered 40 passenger and baggage combination cars from the W. L. Holman & Co., for April, 1906, delivery. The cars will be 50 ft. long and 9 ft. wide, over all. The special equipment includes Gould couplers.

The Atchison, Topeka & Santa Fé has ordered 75 passenger cars from the Pullman Co. Thirty of these are smoking cars, 20 are to be partitioned in the center, so as to form a separate compartment for negroes, and the remaining 25 are to be passenger coaches of the most modern type.

The Interstate has ordered five wooden hopper cars of 80,000 lbs. capacity from the Western Steel Car & Foundry Co. and not from the Pressed Steel Car Co., as reported in our issue of October 27. These cars will be 28 ft. long, 8 ft. 6 in. wide and 9 ft. 1½ in. high, over all. The special equipment includes Bettendorf bolsters.

The Pittsburgh & Lake Erie has ordered 1,000, 36-ft. box cars of 60,000 lbs. capacity from the American Car & Foundry Co., and 250 40-ft. gondola cars of 100,000 lbs. capacity from the Pressed Steel Car Co., all for February, 1906, delivery. The special equipment for all includes: Carnegie axles, Simplex bolsters and brake-beams, Westinghouse air-brakes, Camel brasses, Janney couplers, Security door fastenings, McCord journal boxes and Winslow roofs for box cars and Gould journal boxes for gondola cars, Railway Steel Spring Co.'s springs and Andrews trucks.

The Lehigh Valley, as reported in our issue of November 17, has ordered 1,000 hopper bottom steel gondola cars of 100,000 lbs. capacity and 1,500 box cars of 80,000 lbs. capacity from the Standard Steel Car Co., and 500 box cars of 80,000 lbs. capacity from the American Car & Foundry Co. The gondola cars will weigh about 43,000 lbs., and measure 40 ft. long, 9 ft. 4 in. wide and 4 ft. 6½ in. high, all inside measurements. All box cars weigh about 44,000 lbs., and measure 36 ft. long, 8 ft. 6½ in. wide and 8 ft. 1¼ in. high, all inside measurements. The special equipment for all includes: American Brake-Shoe & Foundry Co.'s brake-shoes, Westinghouse air-brakes, Magnus Metal Co.'s brasses, Security doors for box cars, Miner draft rigging, Symington dust guards and journal boxes, Protectus paint for gondola cars, Winslow improved roofs for box cars, and Railway Steel Spring Co.'s springs.

#### BRIDGE BUILDING.

BEAUMONT, TEX.—The Southern Pacific is planning to build a viaduct over its tracks to cost \$50,000. The company agrees to put up the structure if the city will build the approaches.

CHICAGO, ILL.—The engineering committee of the Drainage Board recommends that contracts be let for building the new bascule bridge at Dearborn street as follows: Substructure, to the Great Lakes Dredging & Dock Co. at \$142,253, and superstructure, to the Jackson & Corbett Bridge & Iron Co. at \$143,335; the work to be completed within 18 months.

LITTLE ROCK, ARK.—The St. Louis, Iron Mountain & Southern, it is said, proposes to build a steel viaduct 170 ft. long on two concrete piers 45 ft. high to cost \$25,000 on West Third street to replace the present wooden structure. At Twelfth street, a viaduct 72 ft. long will replace the present structure over the tracks to cost \$11,500, and at Thirteenth street the present bridge will be replaced by a steel structure 64 ft. long. Work on these improvements will be started at once.

MEXICO CITY, MEX.—The Mexican Central has decided to put up 12 steel bridges on its new line between Tuxpan, Colima and Manzanillo. The largest of the bridges will be 150 ft. long and 200 ft. high.

NEW WESTMINSTER, B. C.—The Pitt river bridge will be widened by the Canadian Pacific, but the cost of the work will be paid for

by the government. A. E. White, Secretary of the Board of Trade, New Westminster, can give information.

**PORTLAND, ORE.**—The Northern Pacific Terminal Co. has decided to build a system of elevated streets over the railroad tracks of the terminal yards at a cost of over \$200,000. From Seventh street, near Kearney, a structure will be built gradually rising until it reaches Northrup, where it will intersect a similar structure extending over that street. At this point it will be 22 ft. above the tracks. One branch will follow Seventh street toward the river, descending gradually to the Albina ferry. The Northrup street structure will extend over the terminal company's tracks and gradually descend on Front street. The total length of the viaducts will be 1,600 ft.

**RICHMOND, VA.**—The joint committee of the City Councils of Richmond and Manchester have taken measures to have a site selected for the proposed bridge over the James river. The cost of the new bridge will be about \$377,000.

**SEGUIN, TEX.**—An iron bridge will be built over the Guadalupe river at McQueeney.

**STEPHEN, N. B.**—Extensive repairs will be made to the international bridge between this place and Calais. Address C. H. LaBollois, Commissioner of Public Works, Fredericton, N. B.

**TORONTO, ONT.**—The City Engineer estimates the cost of the proposed subway under the railroad tracks on Bloor street at \$200,000.

**WILMINGTON, DEL.**—Chief Engineer Theodore A. Leison, of the water department, has completed plans for building a concrete bridge 335 ft. long with a 16-ft. driveway and two 4-ft. sidewalks over the Brandywine river. The cost of the proposed structure will be \$35,000.

#### Other Structures.

**CHARLOTTETOWN, P. E. I.**—The new station to be built by the Intercolonial will be of red sandstone 118 ft. x 140 ft., with a baggage room attached.

**JOPLIN, MO.**—The Missouri Pacific is planning to build a brick freight house 75 ft. x 200 ft. here.

**LITTLE ROCK, ARK.**—The Missouri Pacific is having plans made for a passenger station.

**ST. LOUIS, MO.**—The United Railways Co. is planning to build a repair shop here to cost \$75,000.

**SHARPSBURG, PA.**—The Pennsylvania is said to have secured the land necessary for building car repair shops and as a site for large yards. The improvements are to include a dock 500 ft. long on the Allegheny river.

**WILLMAR, MINN.**—Improvements are to be made by the Great Northern on its shops at this place and the capacity of its yards doubled.

### RAILROAD CONSTRUCTION.

#### New Incorporations, Surveys, Etc.

**BANGOR TERMINAL.**—An officer writes that the prospects of building this proposed road, from some point on the Northern Maine Seaport in the town of Herman, Penobscot County, Me., east to Bangor, a distance of about six miles, are very good. Contracts have not as yet been let. The officers recently elected are: Linwood C. Tyler, President; Arthur Chapin, Vice-President, and Charles D. Stanford, Treasurer. The Chief Engineer is P. H. Coombs, of Bangor. (November 3, p. 114.)

**BRANDON, SASKATCHEWAN & HUDSON BAY.**—The railway commission of the privy council has granted this road permission to cross the lines of the Canadian Pacific at Minto and Boissevain and the Canadian Northern at Kanoka. Surveys are now being finished and bids for construction will soon be asked. (Sept. 29, p. 102.)

**BUFFALO & SUSQUEHANNA.**—Preliminary work, it is said, has been commenced by this road to tunnel through Hogback Mountain near Galleton, Pa., to eliminate heavy grades. The work will cost \$1,000,000 or more.

**CALIFORNIA MIDLAND (ELECTRIC).**—Incorporation has been granted a company under this name in California, with a capital of \$3,000,000, to build an electric railroad from Marysville, in Yuba County northeast about 25 miles to Nevada City, with a branch south to Auburn, in Placer County, 30 miles. The incorporators include: John Morton, San Francisco; E. J. de Sable, Jr., San Mateo; L. H. Susman, L. W. Pryor and Walter J. McLean, all of San Francisco.

**CANADIAN PACIFIC.**—This company is said to have given a contract to Ironside, Rennie & Campbell, of Vancouver, B. C., for track laying, ballasting and bridging 45 miles on the Nicola branch between Spence's Bridge, on the main line, and Nicola Lake.

**CATSKILL MOUNTAIN & MOHAWK VALLEY (ELECTRIC).**—Incorporation has been granted this company in New York, with a capital of \$2,000,000 to build a railroad from Cairo, in Greene County, N. Y., west to a point near Oneonta, with a branch from Jefferson, in Schoharie County, south to Stamford, in Delaware County, a total length of about 78 miles. The directors include: E. C. White, E. T. Holdridge, C. V. D. Peck, William B. Reed, Jr., and James W. McCabe, of New York; H. S. Lounsberry, of Portchester; N. Herschfield, of Rochester; G. W. Kendall, of Stamford, and E. E. Billings, of Gilboa.

**CHICAGO, MILWAUKEE & ST. PAUL.**—An extension of this road to the Pacific Coast at Tacoma and Seattle is, according to newspaper reports, now practically admitted by officers of the company. E. W. McKenna, second vice-president, has been quoted at some length in regard to the Pacific Railroad, a company which was incorporated in the State of Washington in October to build from Seattle southeast to Wallula on the Columbia river, just south of Pasco, Wash. The fact that after the numerous previous denials from many sources Mr. McKenna admits the possibility that the St. Paul might be interested in this Pacific Company looks as though the time was not far distant when plans would be definitely announced for a Pacific extension. Evarts, in the northern part of South Dakota, on the Missouri river and the westernmost terminus of any existing St. Paul line, is mentioned as the starting point of the new line to the Pacific, though a railroad—the White River Valley—is being built from Chamberlain west to Rapid City. From Evarts the proposed new line is to run west by northwest, probably to Butte and Helena, thence west across the Bitter Root mountains through Lolo Pass and the Clearwater country in Idaho to Lewiston; thence west through the southeastern corner of the State of Washington to the Columbia river near Wallula. According to this report, there is also to be a branch line from some point on this projected main line south to a connection with the Chamberlain-Rapid City line. It is also said that the middle part of the present gap between Evarts and the coast may be bridged by trackage rights over the Northern Pacific. The president of the Pacific Railroad is H. R. Williams, until recently general manager of the Chicago, Milwaukee & St. Paul, and the chief engineer is W. L. Darling, formerly of the Northern Pacific and the Rock Island.

**COLORADO & SOUTHERN.**—Contracts are reported let by this company for widening all of the embankments on its road between Cheyenne and Orin Junction, 154 miles. This work is to be carried out during the coming spring.

**DELAWARE & SOUTHERN.**—Incorporation has been granted this company in New York, with a capital of \$170,000, to build a railroad from Deposit, N. Y., northeast to Trout Creek, in Delaware County, a distance of 17 miles. The directors include: Charles P. Knapp, of Deposit; William O. Dennis, of Trout Creek; G. H. Perigo, of Scranton, Pa., and others.

**DENVER SOUTHEASTERN.**—Incorporation has been granted this company in Colorado, with a capital of \$1,000,000, to build a railroad from Denver, Col., south via Colorado Springs to Pueblo; thence south to Raton, N. Mex., 225 miles, with a branch from Pueblo east via Las Animas to Amity, about 150 miles additional. Walter H. Tunis, L. W. Herney, W. O. Temple, H. O. Tunis, W. C. K. Duhn and T. B. Doan, of Denver; I. C. Cockey, of Washington; F. A. Sherwood, of Philadelphia, and R. D. Whiting, of New York, are said to be interested.

**EDDY & NORTHERN.**—Incorporation has been granted a company under this name in South Carolina, with a capital of \$100,000, to build a railroad from Marion south to Eddy Lake, about 35 miles. The incorporators are W. M. Burgan and Norman Jones, of Baltimore; George Officer and J. W. Little, of Eddy Lake, and R. B. Scarborough, of Conway.

**GALVESTON-HOUSTON INTERURBAN.**—This company has been organized to build a railroad between these two cities, with branch lines east to Laporte and Seabrook. Franchises have been granted both in Houston and Galveston, and rights of way are being secured. The officers include: J. O. Ross, President; Henry House, Vice-President; F. L. Dana, of Colorado Springs, Secretary, and J. S. Rice, Treasurer. W. J. Moore and Lyman Levy, of San Antonio, are directors.

**GRAND TRUNK.**—An officer writes that this company will depress its tracks at South Parkdale, Ont., to secure better entrance into Toronto. There will be practically no change of the present line, but additional tracks may be put in. The work, including land damage, is estimated to cost over \$1,000,000.

**GRAND TRUNK PACIFIC.**—Ovorn & Olson have been given a sub-contract for grading ten miles of the Lake Superior branch of this road. (Nov. 3, p. 143.)

**GREEN BAY, OSHKOSH, MADISON & SOUTHWESTERN.**—This company, which is building a line from Madison, Wis., north to Cran-

don, a distance of about 200 miles, has secured the right of way for nearly the entire distance. A grading contract has been let to McDonald & O'Connor, of Grand Rapids, for work on the portion of the road between Shawano and the village of Gresham, close to the Indian reservation. The proposed line will cross the Chicago & North-Western near Appleton Junction. (October 6, p. 11.)

**HIGHPOINT-WINSTON-SALEM (ELECTRIC).**—A charter has been granted to a company under this name in North Carolina with a capital of \$450,000 to build an electric railroad from Highpoint northwest with extensions 50 miles long. The incorporators include: C. C. Yeller, J. H. Mills, R. H. Wheeler and others of Highpoint.

**HILLSBORO & NORTHEASTERN.**—This company, which operates five miles of railroad in Wisconsin, is planning to build an extension south through Hub City and Rockbridge to Richland Center, a distance of about 30 miles. The line has been located and rights of way are being secured.

**KNOXVILLE & MARYVILLE (ELECTRIC).**—A company under this name will apply for incorporation in Tennessee, with a capital of \$100,000, to build an electric railroad from Knoxville south to Maryville, about 20 miles. The franchise which the Knoxville Railway & Light Co. has over the bridge has been bought by the Knoxville Traction Co., of which the present company is to be the successor. J. Burger, President of the Maryville Bank; G. P. Gaut, Robert Vestal, Howard Cornick, J. C. Sterchi and others, of Knoxville, are interested.

**KNOXVILLE, SEVIERVILLE & NEWPORT (ELECTRIC).**—A charter has been granted this company in Tennessee with a capital of \$50,000 to build an electric railroad from Knoxville, Tenn., southeast about 30 miles, to Sevierville. The incorporators include: S. P. Condon, J. B. Brabson and Jerome Templeton.

**KOOTENAY CENTRAL (CAN. PAC.).**—Announcement has been made that work on this road will be rushed between Golden and Cranbrook, B. C.

**LOUISVILLE & NASHVILLE.**—It is said that Eddington, Griffith & Co., of Knoxville, will soon begin work on an extension of this line from a point near Pineville, Ky., west 34 miles to Williamsburg, on the Knoxville division. The new line will make a shorter line from the Cumberland Valley division to the Knoxville division.

This company has begun operating trains through its tunnel under Baker's Hill, which is 16 miles west of Nashville. The tunnel is nearly a mile long and cost with approaches about \$2,000,000. It is built entirely through solid rock.

**MEXICAN CENTRAL.**—This company, it is said, will build a branch line from Jimulco, in the state of Coahuila, Mexico, west to Velardena, a distance of about 30 miles.

**MIDLAND & MANITOBA.**—This company, chartered to build a railroad from the American boundary north to Fort Churchill on Hudson Bay, has let contracts to J. Stewart and Zimmerman Bros. to build an additional three miles south of Portage la Prairie. They will commence work immediately and hasten it to completion. Surveyors are now working north of Portage la Prairie, and a number of other contracts will soon be let. Work will be carried on all winter so that some of next year's crop may be taken out by the new route. (Nov. 17, p. 159.)

**MIDWAY & VERNON.**—This company, which proposes to build a railroad from Midway along the north side of Kettle river to a point near Westbridge, B. C., and thence north to Vernon, a distance of 150 miles, has recently sold bonds for \$30,000 per mile to provide funds for building the line. Work is now in progress west from Midway; also between Rock Creek and Westbridge and from the latter place up West Fork towards Wilkinson creek, above Carmi Mills and north over the summit to a meeting with the force now working south from Vernon. This covers the entire route as located. The work will be light on the first 60 miles between Midway and Carmi. Between the latter place and Okanagan Mission, the proposed route passes through a mountainous country which will necessitate some heavy work. It is expected to have the first 20 miles between Midway and Westbridge finished during the present year. McLean Brothers, of Vancouver, are building the first 10 miles west of Midway. Contracts for building the balance of the road will be let this year. The original promoters of this road included Ralph Smailes, Robert Wood, Christopher Wood, Duncan McIntosh, James Kerr and Robert Kerr, all of Greenwood, and Charles Wilson, K. C., of Victoria.

**NORTHERN PACIFIC.**—This company, it is said, has finally decided to build a cut-off from Lind, in Adams County, Wash., west for a distance of about 100 miles to Ellensburg. The proposed road will shorten the distance between these two points over the present route by about 90 miles, the distance on the present line being 190 miles.

**PACIFIC, OMINICA & NORTHERN.**—Work will soon be commenced on this road. The charter has been bought by the Grand Trunk Pacific.

Surveys are now being completed, so that bids may be called for soon. (See Pacific Northern & Ominica, Construction Record.)

**PEA RIVER VALLEY & GULF.**—Incorporation has been asked for by a company under this name in Alabama, with a capital of \$25,000, and headquarters at Troy, to build a railroad from Opelika, Ala., southwest to Portland, Fla., on Choctawhatchee bay, a distance of about 200 miles. The offices of the company will be at Troy, Ala. W. H. Bootlo is President, and J. V. Huff, Vice-President.

**PITTSBURG, INDEPENDENCE & OKLAHOMA.**—A charter has been granted a company under this name in Kansas to build a railroad from Pittsburg, in Crawford County, Kan., southwest via Independence to Ponce City, in Kay County, Okla. T., a distance of about 150 miles. The incorporators include: A. C. Stinch, A. W. Shulthris, J. B. Zeigler and A. Steinmetz, of Independence, and Charles Mitchell, of Cherryville.

**RICHMOND & CHESAPEAKE BAY (ELECTRIC).**—This company, which was incorporated last year in Virginia to build an electric railroad from Richmond north to Ashland, a distance of about 17 miles, is asking bids for building the line. Eighty-pound rails will be used the entire distance, and there will be a double track from Broad street station to Lakeside, a distance of six miles. It is proposed to run express trains, making the trip from Broad street to Ashland in 18 minutes. (See Construction Record.)

**RICHMOND, RAPPAHANNOCK & EASTERN.**—This company, organized in Virginia by Philadelphia and New York capitalists, is negotiating for the sale of \$1,250,000 bonds to build its railroad from Ellersons, near Richmond, Va., east to Urbana, near the mouth of the Rappahannock river, a distance of about 60 miles. R. V. Hilands, Jr., of Philadelphia, is President, and G. W. Carhart, of New York, Vice-President and General Manager. The promoters say that work is to be begun next month. (See Construction Record.)

**ST. LOUIS, ROCKY MOUNTAIN & PACIFIC.**—This company is increasing the working force on the line which it is building from Raton west to Elizabethtown, in Colfax County, N. Mex., 76 miles. Work at present is only being done from Raton westward. The line will be 120 miles long. From Elizabethtown it will traverse the canyon of the Cimarron and cross the Red river to Raton, thence running east along Johnson's mesa to Folsom. The road is to be in operation by July of next year. The maximum grade is 1 per cent. The road will traverse a picturesque country. (Sept. 22, p. 95.)

**SAN FRANCISCO, IDAHO & MONTANA.**—This company, which was incorporated some time ago in Idaho to build a railroad from San Francisco to Butte, Mont., via Boise, Idaho, announces that financial arrangements have been made for building the first division of the line, which will be 210 miles long. It will run from the Snake river valley in Idaho southwest to the Oregon-Nevada line, thence south to Winnemucca, Nev., on the Southern Pacific. From the Oregon-Nevada line to Winnemucca this line will be a branch of the projected main line. The work will be done by the San Francisco, Idaho & Montana Railroad Construction Co., which was formed for this purpose. The proposed road will run through a district in which the United States Government and private individuals are spending about \$15,000,000 for irrigation purposes. (See Construction Record.)

**SEABOARD AIR LINE.**—This company, it is said, is making surveys for a branch to be built from Odenville, in St. Clair County, Ala., northeast via Asheville to Gadsden, 32 miles.

**SIoux CITY, HOMER & SOUTHERN.**—This company, which is building a line from Sioux City, Ia., south to Homer, Neb., a distance of 17 miles, has completed the line to Dakota City, a distance of seven miles, and this was to have been put in operation this month. Construction work will be pushed and it is hoped to have the road in operation this fall. Steam will be used as a motive power until the entire road is completed, after which it is planned to use gasoline electric motor cars. John H. Becker is President. (April 21, p. 131.)

**SNOWBIRD VALLEY.**—A charter has been granted this company in North Carolina to build a railroad from Andrews, in Cherokee County, on the Southern Railway, along Hickory creek and over Long Ridge mountains, thence down Bear and Snowbird creeks into Grand County, about 15 miles. The incorporators include: C. N. Hickerson, E. G. Hennermann, W. B. Hamrick and others, of Andrews, N. C., and W. A. Lewin, of Staunton, Va.

**SPOKANE-COLUMBIA RIVER RAILROAD & NAVIGATION COMPANY.**—A contract has been given by this company to M. P. Zindorf, of Seattle, for grading 63 miles of its road from the Columbia river to Fletcher, in Adams County. The road is to run from Spokane through Fletcher and Cornell to the Columbia river, connecting there with steamers to Portland. The entire cost will be about \$4,000,000. (June 30, p. 216.)

**TENNESSEE & GULF.**—The Tennessee Industrial Railroad Company has changed its name to Tennessee & Gulf. The projected road was to run from a point on the Cumberland river near the mouth of Harpeth river to Clifton, Tenn., 70 miles. The new com-

pany has changed the proposed route from the Harpeth river to the south side of the Cumberland river about four miles below the former location. The company proposes also to build a branch from the main line at Lobelville, in Perry County, to Nashville. (See Construction Record.)

**UNION PACIFIC.**—Announcement has been made by this company that its line in Wyoming, for a distance of 77 miles, will be double tracked. Bids will shortly be asked for grading on three sections, as follows: Between Hermosa and Hermosa Junction, two miles, completing the double track between Cheyenne and Laramie, with the exception of 25 miles between Hermosa and Buford; Look-out to Hanna, 50 miles. This portion of the work will be the most costly to be carried out by the company, the grading near Medicine Bow being unusually heavy. The third section is between Rock Springs and Point of Rocks, 25 miles.

**VIRGINIA & SOUTHWESTERN.**—A contract is reported let by this company to Walton, Wilson, Rhoads & Co., of Knoxville, Tenn., at between \$5,000,000 and \$6,000,000 for building 70 miles of its proposed road from Clinchport, Va. (September 8, p. 80.)

**WASHINGTON ROADS.**—According to newspaper reports, Henry J. Pierce, President of the International Traction Co., of Buffalo, N. Y., in connection with Eastern capitalists, will build a railroad through the valley of the Cascade mountains in Washington, connecting Tacoma, Seattle and other cities in that state, the total length of road to be 162 miles. Surveys are being made through Cowlitz Pass. The officers of the company are: Frank A. Dudley, President; R. E. Strathorn, Vice-President and General Manager, and A. G. Smith, Secretary and Treasurer, of Buffalo, N. Y.; James A. Kerr, of Seattle; A. Fechter and John J. Rudkin, of Spokane, and others are directors.

**WEST TEXAS & NORTHERN.**—A charter has been filed by this company in Texas, with a capital of \$500,000, to build a railroad from Kerrville, Tex., in Kerr County, north through Kimble, Mason, Menard, Concho, Tom Green, Coke, Sterling, Glasscock, Howard, Martin, Dawson, Lynn, Lubbock, Hale, Swisher and Randall Counties to Amarillo, in Potter County, a distance of 450 miles. The incorporators include: E. P. Sears, J. T. Pinson, J. W. Pierson, John T. Witt, E. H. D. Gaston, J. A. Wilhite, all of Dallas; Will P. Edwards, W. R. Cole, G. L. Brown, S. H. Morrison, all of Big Springs. The offices of the company will also be at Big Springs.

#### RAILROAD CORPORATION NEWS.

**ATLANTIC COAST LINE.**—The directors have declared a semi-annual dividend of 3 per cent. on the \$42,980,000 common stock. Since 1900 the semi-annual dividend rate has been 2½ per cent.

**CHICAGO, MILWAUKEE & ST. PAUL.**—It is reported that this company has applied to the City Council of Seattle for the right to enter the city and establish terminals at that point. (See Railroad Construction.)

**CHICAGO, ROCK ISLAND & PACIFIC.**—A subsidiary company under the name Rock Island, Arkansas & Louisiana was incorporated on October 31 as a merger of the Little Rock & Southern, the Arkansas Southern and the Arkansas Southern Extension. The Little Rock & Southern is now building a line from Haskell, Ark., near Traskwood on the Little Rock-Hot Springs branch, south to Eldorado, 117 miles, and also a branch from Summer-ville, Ark., to Crossett, 36 miles. Its charter empowers it to build certain other lines in Arkansas. The Arkansas Southern operates a road from Eldorado, Ark., to Winnfield, La., 100 miles. The Arkansas Southern Extension owns a road from Winnfield, La., to the southern boundary of Winn Parish. Its charter authorizes it to build to Alexandria and elsewhere in Louisiana. For further information about projected extension see Railroad Construction column, November 17, page 160.

**DELAWARE & HUDSON.**—Interests identified with this company have made an offer to purchase the \$5,000,000 capital stock of the United Traction Company at Albany at about 150. Issues of not more than \$5,000,000 4 per cent. preferred stock and \$2,500,000 of 3¾ per cent debentures of the new holding company, the name of which is not yet announced, will be made in proportion to the amount of capital stock of the United Traction Company which is acquired. Principal and interest of these new securities will be guaranteed by the Delaware & Hudson Company. The United Traction Company operates 85 miles of electric road in Albany, Troy and neighboring towns. Gross earnings of the Delaware & Hudson for the quarter ended September 30 were \$3,314,197, an increase of \$268,446. The net earnings were \$1,357,748, an increase of \$27,390, and the surplus was \$610,937, an increase of \$17,964.

**DETROIT, TOLEDO & Ironton.**—The combined gross earnings during the three months ending September 30 of this road and of the

Ann Arbor were \$939,625, and net earnings \$303,362. The operating ratio of the Ann Arbor was 65¾ per cent, and of the Detroit, Toledo & Ironton 70¼ per cent.

**GAINESVILLE MIDLAND.**—This company has filed a mortgage, for an amount not to exceed \$1,000,000, in favor of the Savannah Trust Co., of Savannah, trustee. This mortgage secures the recent bond issue of \$625,000 and will also secure a further issue to be made if the company decides to build additional extensions. (November 10, p. 150.)

**GRAND TRUNK.**—The gross earnings of this company for the half-year ended June 30 were \$13,235,639, an increase of \$823,006 as compared with the corresponding period of 1904. Receipts from both freight traffic and passenger traffic increased about 7 per cent. The operating expenses were \$9,328,669, an increase of \$135,160, the operating ratio decreasing from 74 per cent. to 70 per cent. on account of the saving in the expense of conducting transportation, the winter and spring of 1904 having been a season of unusual severity. Maintenance of way cost \$1,303,020, an increase of \$107,132, and maintenance of equipment \$2,064,732, an increase of \$430,908. The surplus available for dividends was \$1,414,512.

**HELENA LIGHT & RAILWAY.**—This company, which was organized recently to take over the properties of the Helena Light & Traction Co., Helena, Mont., is offering in Europe \$850,000 5 per cent. 20-year sinking fund gold bonds, which are part of an authorized issue of \$1,500,000, two-thirds to be issued at once and the rest reserved for additional plants and betterments. The company owns 17 miles of road in Helena and also controls all of the gas and electric light plants in the city.

**INTERBOROUGH RAPID TRANSIT (NEW YORK).**—The report for the quarter ended September 30 shows a surplus after charges of \$109,819. Gross earnings were \$3,905,097, an increase of \$672,148. Net earnings were \$1,937,651, an increase of \$73,796. The gross earnings of the Manhattan (elevated) division decreased about 13 per cent. and showed a deficit after charges of \$117,741, as compared with a surplus of \$411,311 during the same period of last year. The Subway division, therefore, earned a surplus of \$227,560.

**METROPOLITAN STREET RAILWAY (NEW YORK).**—N. W. Harris & Co., New York, are offering \$180,000 first mortgage 5 per cent. gold bonds of the South Ferry Railroad, which is a subsidiary company of the Metropolitan, owning 1¼ miles of road.

**NEW YORK CENTRAL & HUDSON RIVER.**—The directors have decided to issue \$17,192,500 capital stock to be offered at par to stockholders of record December 15, to the extent of 13 per cent. of their holdings. The right to subscribe terminates on January 20. This is part of an authorized issue of \$150,000,000, of which \$132,250,000 has been already issued. In 1902 the authorized amount of capital stock was \$115,000,000, and an increase to the present amount was then authorized, an issue of \$17,250,000 being taken by the stockholders at 125. As New York Central stock is at present selling at about —, the "rights" of this latest issue are worth about \$6.75 a share.

**NEW YORK, NEW HAVEN & HARTFORD.**—The stockholders of the Boston & New York Air Line (leased to the New York, New Haven & Hartford) have voted to issue \$5,000,000 first mortgage bonds. It is said that the proceeds of the sale of these bonds will be used to repay the company's indebtedness to the New York, New Haven & Hartford, which paid up the \$500,000 first mortgage 5 per cent. bonds which matured August 1, 1905, and for double tracking between New Haven and Willimantic.

Formal transfers of six lines of Sound steamers owned by the New York, New Haven & Hartford to the New England Navigation Co. was made at New Haven on Tuesday last. The lines are the Old Colony Steamboat, the Providence & New York, the Norwich & New York, the New London & New York, the New Haven & New York and the Bridgeport & New York companies.

**NEW YORK CITY RAILWAY COMPANY.**—This company, operating the Metropolitan and other lines in Manhattan, had gross earnings during the quarter ended September 30 of \$4,509,610, an increase of \$149,431 as compared with the same period in 1904. The net earnings were \$2,217,352, a decrease of \$69,466, and the total income was \$2,556,768, a decrease of \$61,999. The charges being \$2,803,050, there was a deficit of \$246,282, an increase of \$66,807.

**UNITED TRACTION COMPANY OF ALBANY (ELECTRIC).**—See Delaware & Hudson.

**WESTERN NEW YORK AND PENNSYLVANIA.**—The gross earnings of this company during the quarter ended September 30 were \$1,804,001, an increase over the figures for the same period last year of \$419,579. Net earnings were \$456,001, an increase of \$302,979. The surplus being \$150,291, as compared with a deficit last year of \$132,034.

